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MINUTES,
EXPERIMENTS, OBSERVATIONS,
AND
GENERAL REMARKS,
ON
AGRICULTURE,
IN
THE SOUTHERN COUNTIES;

A NEW EDITION.

TO WHICH IS PREFIXED
A SKETCH OF
THE VALE OF LONDON,
AND
AN OUTLINE OF ITS
RURAL ECONOMY:
NOW FIRST PUBLISHED.

By MR. MARSHALL.

VOL. II.

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By MR. MARSHALL.

VOL. II.

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1777.

GENERAL REMARKS

IN

THE SOUTHERN COUNTIES.*

277.

AGRICULTURE.

MAN, as an animal, has few wants ; and, probably, there has been a time, when the spontaneous produce of the soil was thought adequate to them.

In the present state of populousness, independent of luxury, the spontaneous growth would be found very unequal to his indispensable exigencies. Therefore, from AGRICULTURE, the *necessaries* of life proceed.

* Written in 1777 ; and published in the DIGEST of the MINUTES of AGRICULTURE.

VOL. II.

B

277. AGRICULTURE.

By AGRICULTURE, mankind *preserve* existence. And agriculture, in a state of *natural* populosity, is the natural profession of man.

But, in a state of *trade*, where circulating media alleviate every want, it is not necessary, that each individual should be an agriculturist ; nor, in a state of *commerce*, that each community should produce the immediate means of its own preservation. It is, however, absolutely necessary, that commercial nations, collectively, should provide for the natural necessities of the commercial world.

But a state of confirmed commerce is a state of luxury, where natural necessity is absorbed in superfluity ; and each community has other means of subsistence ;—as mining, hunting, fishing, navigation, merchandise, trade, and manufactures. But mining, hunting, fishing, are partial ;—and commerce, is temporary,—shifts, from place to place,—and, like the serpent, charms but to destroy. AGRICULTURE alone is *permanent*, and common to the habitable world ; from agriculture, the *lasting* welfare of a

277. AGRICULTURE.

nation proceeds; and agriculture, even during a blaze of commercial splendor, is the FIRST OBJECT OF EVERY COMMUNITY.

But *public* and *private* agriculture differ widely. That regards the community, without considering the individual:—this, *simply considered*, views the individual, regardless of the whole:—and PRIVATE AGRICULTURE, in a state of commerce, where each individual has a choice in his profession, becomes, *simply considered*, a PECUNIARY EMPLOYMENT.

But an individual is a son of nature,—a brother of mankind,—a member of society,—and a man;—and he has four principal

Motives to private agriculture:

A love of nature,	A love of himself;
A love of mankind,	divisible into,
A love of his country,	Self-amusement,
	Self-emolument.

278.

F A R M S.

THE SIZE, which appears to be most profitable to the community, and which is capable of affording the most amusement, and proportionably the most emolument, to the occupier, is of the middle cast ; as from one to five hundred acres, four fifths of which are arable : because a man, who has farming knowledge, and a capital, will not accept of a small farm ; and a plow farm of five hundred acres is adequate to any man's attention. Farms of less than one hundred acres fall into the hands of the ignorant, and indigent ; those above five hundred, must be, in some degree, neglected, be the possessor ever so alert ; because, where there are more than one farmery, there must be *irrigid* management ; and, of a very large farm, with only one farmery, some part must lie at too great a distance from the farm yard,—even supposing the farm a cir-

278. FARMS.

cle, and the farmery its center : and whatever increases horse labor robs the community. Therefore, perhaps, from two to three hundred acres of culturable soil, four fifths of which are arable, is the most *political* farm : if not, the Writer will venture to pronounce it the most eligible, for a man, who wishes to unite amusement with emolument.

279.

FARMERIES.

THE PLAN of a farmery, or homestead, should accord with the CHARACTERISTIC of the given FARM. An arable farm requires one, different from a fatting farm ; a fatting farm, from a dairy farm ; and a dairy farm, from a hay farm. Indeed, it would be as inconsistent, to give a general plan for a farmery, as to dictate, in general terms, the management of a farm : for different farms require different managements, and each a different suit of yards and erections.

279. FARMERIES.

The Writer, therefore, does not offer the plan and description of *his* farmstead, as a pattern to others; but as a mirror, in which they may see the advantages, and defects, of their own; and as a collection of hints, to the man who wishes to plan one.

See Plate I. and DESCRIPTION of the FARMERY, VOL. I. p. 65.

The principal FAULT lies in the dung pit; which is situated immediately before the barn doors; and, consequently, if a cart or waggon be driven through it, into the barn, the wheels collect the mud, and carry it upon the floor. A dung *pit* preserves much of the fine part of the dung; and, if the superfluous water be repeatedly thrown over it with a scoop, forwards the digestion of that which is crude: and is far more eligible than a dung *hill*. But it ought to be placed, so as to leave a free passage to the barns.

It WANTS, at present, a shed, high enough to admit a load, or loads, of hay or corn: such a shed being very convenient in a showery harvest.

If it has any *peculiar* ADVANTAGE, it is in

279. FARMERIES.

the form of the stack yard, which is exceedingly commodious. The farm yard is warm (it was not laid out as a *straw* yard), and its compactness makes it very convenient. The cart shed opens from the common, by five-barred gates; and is placed, as it ever ought to be, between the common road to the yard, and the cart horse stable; the driver leaving his implement, under cover, in his way to the latter. The swinery, too, is commodious.

The barns are furnished with eaves gutters, to prevent the rain water, which falls on them, from running into the dung pit. The sheds and hovels, too, have only half roofs, which throw the water out of the yard: the dung pit, therefore, receives only the rain, which falls in the yard; including the granary, and gangways. But even this is too much; and, in wet weather, it overflows; making the yard uncomfortable.

Why not carry out the superfluous water, as liquid manure? This is a tedious business; and, by a treble and accurate experiment, on clover and tares, on sandy loam,

279. FARMERIES.

twenty pipes, an acre, were scarcely of perceptible service. See EXPERIMENT, 324.

The Writer does not bring forward this experiment, as a proof of the worthlessness of dung water: the time of the year, the weather, the soil, the crops, &c. perhaps, were not favorable. He will, however, venture to say, that it is better management to prevent, than either to waste, or cart out, a superfluity of yard liquor. If a surcharge cannot be avoided, and the farmery lie higher, than any part of the farm, it may be very good management, to make a channel, or channels, to conduct it to such lower part. But the above experiment leads him to be of opinion, that, except yard liquor be very rich indeed, it is not an object of team labor.

280.

S O I L S.

SOILS are infinitely various; no two distinct portions being identically the same, in matter and state.

All culturable soils are compounds : consequently, the ordinary distinctions are, in some degree, arbitrary ; there being no such thing, in reality, as a cultured field of CLAY, SAND, OR GRAVEL. These terms, nevertheless, are useful in agriculture ; as they convey strong ideas of *very clayey*, *very sandy*, and *very gravelly* soils.

There are other general divisions of soils : they are STIFF, OR LIGHT ; that is, tenacious or friable ; and WET OR DRY ; or, in other words, they have retentive or absorbent SUBSOILS.

Another, and more general, division is,—soils are FERTILE, OR INFERTILE. Experience tells us, that a fertile soil is, by repeated vegetation, impoverished ; — provided the produce be constantly carried off : but, by returning the produce, or by a foreign supply, not only that soil may be re-invigorated, but a barren soil may, thereby, be made fertile.

Therefore—to vegetation, some particles of soil are *active*, some *inert*. And, perhaps, the agriculturist ought never to lose sight of this maxim.

280. SOILS.

Every active particle, carried off the farm, is an actual loss : every such particle, brought on, a real acquisition.

Nor consequently this :

Every active particle, not immediately in the field of action, is rendered inert. Every inert particle brought into action, is, at least, a temporary acquirement.

That which gives an addition of active particles, is called MANURE. Whatever excites, or sets at liberty, those which were inert, may be termed STIMULANTS.

281.

M A N U R E S.

THE soil is the farmer's cash book ; and every crop he takes is a draft on his banker ; the amount of which MANURE, alone, can replace.

It is fortunate for the farmer, when he can discover any FOSSIL manure, on or near his farm. It is likewise advantageous, if he can

281. MANURES.

purchase dung, or other VEGETABLE OR ANIMAL SUBSTANCES, at a reasonable rate. But, even these, precious as they are to a farmer, may be bought too dear. How prudent, therefore, it is, to make the most of what his farm produces.

282.

MANURING.

THE MINUTES on Manuring, before July 1776, abound with the favorite idea of *feeding on a firm surface*; an idea, in some degree, erroneous. It arose from the favorable effect of dunging a *light land* ley, *in winter* (See Min: 21. and 71.), and a *stiff-land* ley, *in summer* (See Min: 87.), both of which practices the Writer still believes to be good. But ideas, in Agriculture, will seldom bear generalizing; and he is fully convinced, that to dung a *stiff-land* ley, *in winter*, is bad management.

For, during the winter of the year 1776,

282. MANURING.

he made several comparative experiments (as will appear) on both mixgrass and clover leys, with a variety of manures. But this haytime can scarcely point out a distinction, in the crops; notwithstanding some of the experiments were made, with twelve or fifteen loads of strong compost, an acre. It is not apprehended, that this manure is wholly thrown away; but, being laid on, when the soil was replete with moisture, it was prevented from sinking, deep enough, to assist the first year's crop.

The author begs leave to submit the following theory. During the *drought of summer*, CLAYEY SOILS are divided, by innumerable fissures; and, if manure be laid on, while the soil is in this state, the first shower of rain carries down the dissoluble particles, into the vegetative stratum. But, *in winter*, a retentive soil resembles a sponge filled with water; and the manure laid on, while it remains in this state, is either washed away, by heavy rains, or lodged on or near the surface; and cannot penetrate the soil, until it be made porous, by the ensuing summer's drought.

On the contrary, an ABSORBENT SOIL is *always* open, to superficial moisture : it resembles an empty sponge, which greedily absorbs the moisture it can reach ; and, as fast as the manure, laid on such a soil, becomes fluid, it is received by the corn mold. The danger, here, seems to lie, in its being hurried *through* the vegetative stratum. Is not winter, then, the fittest time to manure such a soil, when the current of absorption is the gentlest ? rather than summer, when its rapidity may hurry down the vegetable food, and prevent its being incorporated with the plant-feeding mold ? and is it not obviously eligible, on such a soil, to lay the manure on the surface, at the greatest distance from that depth, at which it becomes useless ? rather than to bury it, in the soil, where it may more readily escape below the sphere of vegetation ?

The Writer is, at present, so fully satisfied, with the former part, at least, of this theory, that he is determined not to manure, in future, the surface of a retentive soil, when its pores are full : he will either embrace the opportunity, when dry weather

282. MANURING.

has rendered it absorbent, or mix the manure, with the soil, in a state of fallow.

283.

THE WEATHER.

THE AUTHOR has been attentive to NATURAL PROGNOSTICS, and he believes himself somewhat better informed, than when he began to make his observations. On a close inspection, however, he has sometimes found those appearances, which pass for prognostics, dwindle into what are termed, in medical language, diagnostics: not preceding, but attendant symptoms.

He does not, however, mention these circumstances to deter others from making observations, which may afford them a great share of pleasure, as well as profit; but as hints to put them on their guard. He will, nevertheless, venture to deliver, as his present opinion, that there is more truth, in the BAROMETER, than in all the PASTORAL MAXIMS which language can produce. Yet he

283. THE WEATHER.

is by no means a believer in the infallibility of the barometer; as he has, more than once, found it deceptive: and the farmer who places implicit confidence, in any thing but his own watchfulness of the fair opportunity, manages indiscreetly.

It is this uncertainty of the weather, that causes those unpleasing anxieties, which every farmer must, more or less, feel, let him be ever so callous, or ever so philosophical. But, to repine at the weather is to repine at fate; and what thinking man will wittingly aggravate his own disquiet? He will rather endeavor to avert, than to contend with ill fortune; and the farmer, who wishes for days of cheerfulness, will ever embrace the FAIR OPPORTUNITY, and endeavor to guard against the UNCERTAINTY OF THE WEATHER.

284.

SERVANTS.

THE AUTHOR was more embarrassed, in the selection of the MINUTES on SERVANTS, than in the choice of those, on any other subject. On the one hand, he was aware of the irksomeness, which must ever accompany a recital of domestic bickerings. On the other, it would have been truly inconsistent, in a man who professedly becomes public, to hold out lights to the inexperienced, to have obscured the beacon, which, of all others, ought to be rendered conspicuous: for, on a proper management of servants, depend, in a great measure, the profits and the pleasures of agriculture. He has, therefore, selected for publication, such, and such only, as he thinks may convey some useful hint, to the novitiate agriculturist.

He may have been (he hopes and believes

284. SERVANTS.

he has been) unfortunate in the neighbourhood he happened to fix in;* yet he cannot help thinking, that the seeming ingratitude of servants is not confined to any particular district; but is a universal frailty, founded in human nature; and depends, principally, upon their management.

Self-love is the sovereign of master and servant; and SELF-ESTIMATION a fomentor of public and private discord.

By way of illustration: I am a servant. I receive a favor, which I did not expect; I reason thus: "this favor must proceed, "either from my master's generosity, or "from my deserts: my master, it is true, "is generous, and so am I deserving;— "how many good offices have I done him? "how often have I done those things, which "many other servants would have left undone? he must have perceived this, and "thus he requites me." I *value* myself on this, but continue to do my duty; and my master (who probably has put *no small estimate* on his generosity) continues to give me good usage: but he does not *repeat* his

* See Vol. I p. 25.

extra favor, at the time when, in my own esteem, I deserve it, and of course *expect* it. I fancy myself slighted, and grow indifferent;—my master perceives it, and treats me with reserve. I begin to think my good offices thrown away, and grow neglectful of my duty; my master sees this, and becomes authoritative. I, fancying myself too important to be dismissed, resent it; and he, to disburden himself of an incumbrance, discharges me. Now, and not till now, I perceive my mistake; it was not my deservingness, but solely my master's generosity, which conferred on me the favor. I did, or endeavored to do, my duty; and my master, by way of encouraging me in the perseverance of it, and to gratify his own good disposition, unfortunately conferred on me that, which has been the cause of many unhappy hours, and has at length brought me to this disgrace. Had I not received a favor, which I did not *expect*, I should still have been the dutiful servant of an indulgent master.

The writer is so fully convinced of the mischievousness of granting *unexpected* fa-

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vors to farm servants (and to ignorant servants in general), that he has, more than once, got peaceable riddance of a troublesome fellow, by exalting him above his fellow laborers.

This may seem to strike at the root of the first of Christian virtues. God forbid, that it should close the hand of Charity, where *charity* is due. But it is a proper choice of the object, not the gift, which constitutes benevolence: it is not the number of pieces given, but the hours of wretchedness alleviated, which give the sum of charity.

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BEASTS OF DRAFT.

BROOD MARES. Notwithstanding this species of beasts of labor are unnoticed, in the Minutes, the Writer has lately made some trial of them: not enough, however, to decide, with certainty, upon their com-

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parative merit. Yet, from the experience he has had, he will venture to assert, that, in a rough grass country, or with the conveniency of a forest or waste, they are, with tolerable luck, more profitable to the farmer, than geldings, or uncovered mares. If they be put to the horse, the latter end of June, or the beginning of July, they will come, opportunely, between the spring and the autumnal seedtimes, and the loss of labor will consequently fall, on the most vacant part of the year.

But what would be the consequence, were farmers, *universally*, to sell off their horses and oxen, and adopt brood mares, as beasts of draft? the answer is plain: in a few years, the utmost produce of the soil would be unable to support the breed of horses: man would be obliged to look out, for foreign sustenance,—or learn to feed on horse flesh.

Brood mares, therefore, though they may be profitable, to a few individuals, can never become general.

OXEN and HORSES. The value of oxen can only be ascertained, by comparing them with other beasts of labor: and, in this

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country, horses are their principal competitors.*

The comparative merits and demerits of beasts of draft rest, principally, on

Their first cost,	Their work,
Their keep,	Their value after working.

THEIR COST. A powerful, handsome, six-yearold ox may be purchased, for ten or twelve guineas :†—A powerful, handsome sixyearold horse will cost, from twenty to twentyfour guineas. Suppose that ten guineas, a head, are saved, by purchasing oxen, instead of horses, and that a farmer has occasion for three teams ;—he will have an addition, every ten or twelve years, of one hundred and twenty guineas, to stock and improve his farm with.

THEIR KEEP. This depends, in some measure, on the prices of hay and corn, and on the size and voraciousness of the animal to be fed. Taking into the account the

* MULES have been worked, by individuals: but I have not found them, anywhere, in common use, among professional men.

† Might have been, at the time this was written.

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unavoidable pilfering of horse carters, and we may safely set down, that, on a par of years, an aged ox may be kept at two thirds of the expence, of a large cart horse.*

THEIR WORK. The Author will not, here, contend for superiority; but he will aspire at equality; though he may fall somewhat short of it. That oxen are equally tractable, and equally versatile, is fully evinced in the Minutes. Their strength depends upon their age, their size, and breed; and their activity on their make and courage.

A twoyearold steer is as worthless, in work, as a twoyearold horse is; and the working of either is unpardonable. An ox does not arrive at full strength, especially if worked while young, until he be six years old. At this age, a large deep-chested ox

* Desirous, however, as the writer is to promote the working of oxen, he must not conceal, that he has not, yet, attempted to work them, *constantly throughout the year*. They have always had a month's grazing, in the spring; and have generally had some leisure days, in winter: their fodder, however, in this case, has been proportionable.

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is equal, in strength, to a strong, well made cart horse.

Thus far, therefore, an aged ox is, in work, equal to an aged horse; and a want of activity, in the former, can alone render him inferior.*

THEIR COMPARATIVE VALUE, AFTER WORKING, appear in Minute 262.

Recapitulation.

In first cost, oxen have greatly the advantage.

In keep, they have likewise a great superiority.

In tractability, equal.

In strength, equal.

In agility, horses gain an ascendancy. †

In value after working, the ox is, beyond comparison, superior.

Supposing oxen's want of agility, added to their *supposed* incapability of being worked, constantly through the year, to balance

* When this remark was made, I had not experienced the activity of the oxen of the WEST OF ENGLAND.

† But see the above Note.

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their superiority in point of keep, there still remain two valuable advantages, on their side ;—either of which might be thought a sufficient motive, for employing them, in works of agriculture, in preference to horses : yet, oxen have, lately, been losing their repute ; while horses, almost throughout England, have been gaining ground, as beasts of agricultural labor.

How is this incongruity to be reconciled ? Perhaps, thus : oxen have usually been *worked too young, and fed too low* ; thus rendering them ineffective. Their being worked, *double*, made them unfit, for wet land, in wet weather. Their weakness, poverty, and of course dullness, added to the uncouthness of the yoke and goad, when compared with the corn-fed horse, the gaudy harness, and whalebone whip, rendered them contemptible, in the eyes of plowmen and carters.

Trivial as the last observation may appear, to the inexperienced in farming, it has, perhaps, contributed, more than any other cause, to the disrepute of oxen. A

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good plowman feels his consequence, and will not hold after a team he dislikes ; a good farmer knows the value of such a servant, and provides a team, which he thinks will tempt him into his service ; and is particularly cautious, when he has got a good a plowman in his pay, not to obtrude on him a team, which he knows will force him out of it. The example is set : inferior plowmen, and inferior masters, in this, as in other things, *follow the fashion*.

THE author having thus communicated his unfeigned sentiments, on the eligibility of oxen, as agricultural beasts of labor, and being fully aware, that there are many men, who hold the same principles, without having had the same practice, as himself, he will attempt to sketch out such a plan of management, as he apprehends may conduce, the most, toward their useful information.

BREED.—A hornless, or a short-horned, breed is, for harness, obviously more eligible, than one whose horns are long and wide. MORE DEPENDS ON THE ACCURACY OF

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FORM, IN WORKING OXEN, THAN IN WORKING HORSES: the BREED, therefore, ought to be cautiously attended to.*

The outlines of a well made working ox are sketched, under the 16 Feb. 1775.†

REARING.—Perhaps, steers ought to be well kept, but not much worked, until they be four years old. And not worked, hard, until past five years old. See 5. April, 1777.‡

BUYING.—The Writer would not wish to purchase an ox, for harness, under five or six years old: he will, at that age, make one in a team of four, and may be hard worked, without the danger of straining him; and thereby bringing on disorders, to which hard-worked young oxen are liable.

WORKING.—The causes of their declen-

* Yet, generally speaking, no attention has ever been paid to it, with a view to this important end of breeding cattle!

† For further remarks on this subject, see YORKSHIRE, GLOUCESTERSHIRE, MIDLAND COUNTIES, and WEST OF ENGLAND.

‡ Perhaps, cattle are one year longer, in reaching maturity, than horses. Perhaps, a horse, at four years old, is as mature, in strength, as an ox, at five.

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sion, mentioned above, may serve as guides to their re-establishment.

Do not retard their growth, endanger their health, render them insignificant in the eyes of the many, and disgusting to their keepers, by working them too young. There is no danger of their becoming unmanageable: nose rings will reclaim them, be they ever so riotous.*

Do not expect that they can work, constantly, on straw: nor expect to find them alert and spirited, while their buttocks are clodded with dung, and their coats, throughout, are filled with dirt, and vermin.

Divide them into teams, of four:—let each team be fed, by its respective carter. Provide him with a currycomb, laquered on the back, and a brush, bound with gilt leather. With these he will take a delight, in combing off the dirt, and brushing out the dust and filth. The ox, too, after the sensation becomes familiar, partakes in the pleasure, and will momentarily forego his meal, to receive the full enjoyment.—His feeder

* Nevertheless, the younger they are enured to light work, the more docile they will generally become.

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perceives this, and brushes the part which gives the most pleasure. The ox shows his gratitude by wagging his tail :—the carter, in return, calls him by his name, and tells him of his good qualities. Thus, not only an intimacy, but a mutual affection is formed, which at once gives attention to the keeper, and docility to the ox.

A good carter feeds his cattle, early and late, and, by little and little ; being careful not to give them more, at once, than they will eat, immediately.

Their labor, and their fodder, ought to be so proportioned, that their health and their spirits are kept in full tone. Their coats ought to be sleek ; their hides loose and silky ; the flank should fill the hand, and the shoulder handle mellow. If they be over-worked or under-fed, disease and sluggishness must inevitably follow. A working ox ought always to be *beef*, that, in case of accident, he may grace, at least, the poor man's table.

If oxen are to be introduced into a horse-team country, not only attendance and attention, but some address, is necessary.

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Their names must be horse names ; and these, too, the most popular. Their harness must be horse harness, and their bridles horse bridles, (as nearly, at least, as the make of their shoulders and heads will permit). They must be taught the most fashionable horse language, of the hundred they are to figure in ; consequently, a well bred horse carter must, at any wages, be procured. He ought to be such a one, as can swear gracefully, and bully with an air of superiority. He must be dignified with the title of first carter, and his team with that of the best team. Their trappings must, of course, be more highly ornamented, than those of the horse teams ; the colors of the fringe must be brighter, and more variegated ; the tassels must be larger, and the topknots stand higher, than those of any other team, on the farm : and, above all, his whip must be made of the best bone, and be at least a foot longer, than any other whip in the parish. Should his team be run down, or should he, as ox carter, be affronted, by any of his fellow servants, or laborers, a serious and severe reprimand ought

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to follow. Should any of them dare to degrade him with the hateful appellation of "oxpoker,*" the crime ought to be deemed capital, and immediate dismissal take place.

The following dialogue, which the Writer overheard, with uncommon satisfaction, may convey a useful hint, to the agriculturist, who may attempt the working of oxen.

The ox carter, and one of the horse carter having quarrelled over their lunch, the latter, being overpowered in argument, had recourse to scurrility ; and, in an audible voice, as he drew off toward his team, began the skirmish with—"Get out, ye oxpoker!"

The other, still sitting under the hedge, with his feet in the ditch, his knife in one hand, and his bread and cheese in the other, returned with disdain, "Get out, ye *carrion-flogger!*"

Horse carter. Carrion ! D——n ye, my horses are fed, with good sound oats and beans ; your brutes are glad of a little straw

* A word which has deprived the Writer of more than one good servant.

285. BEASTS OF DRAFT.

and musty hay, shook up together : Get out, ye oxpoker !

Ox carter. So much the better for my Master, ye fool ! You are not content with beans and oats, you know, but you must steal wheat, for your *dog's meat*, and be d——'d to ye !*

Horse carter. Get out, ye oxpoker !

Ox carter. (Shaking his sides at the rancour of his antagonist, and exulting in the victory he had gained),—And your team, after all, is only fit for cur dogs and *carrion crows* ! Mine, ye rascal, is the roast beef of Old England, fit to be set before KING GEORGE ! Get out, ye carrion-flogger. Ha ! ha ! ha !

Anxious, however, as the Author is, in the cause of CATTLE, he is aware that the working of them will not become *general*, until the practice be promoted, by LEGISLATIVE AUTHORITY.

He is not less averse to restraints, than are the most tenacious of his countrymen. But what are *laws*, in general, but *restraints* ?

* On breaking open his binn, it was found nearly half full of wheat in chaff !

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Laws are necessary ; therefore restraints are necessary ; consequently judicious restraints are good laws.

Horses, as has been said, are the principal competitors of cattle, as beasts of draft ; and a restraint on the increase of horses, would tend to promote the working of cattle. How are horses increased, in England ? Not by importation, but by breeding : and, perhaps, a TAX ON THE BREEDING OF HORSES would be the most salutary means of encouraging the working of cattle ; and be the most effectual method of LOWERING THE PRICE OF HUMAN FOOD.

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I M P L E M E N T S

(OF THE WRITER'S INVENTION)

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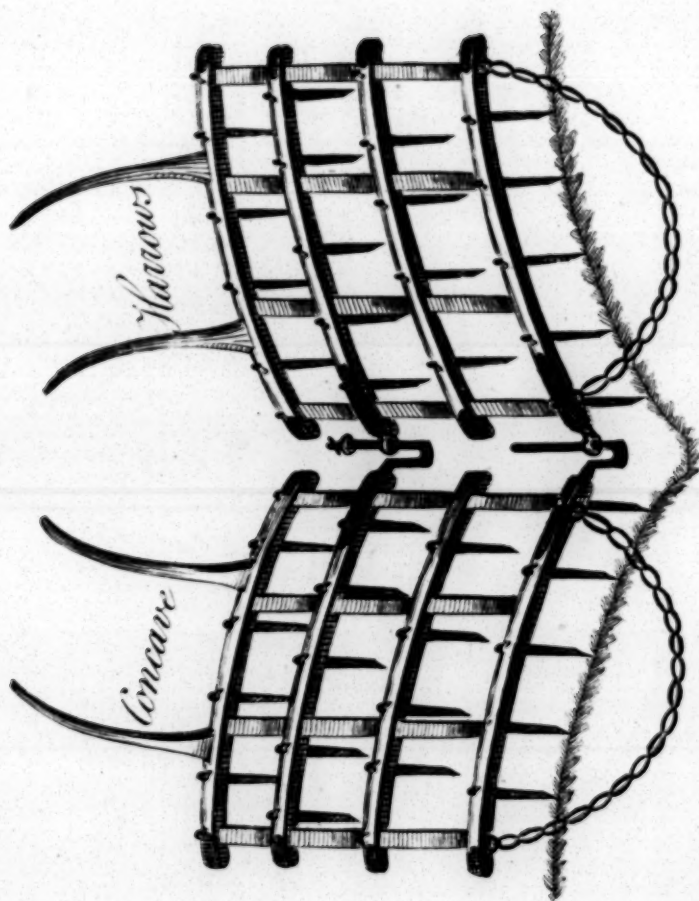
CONCAVE HARROWS. See PLATE II.
These are spoken of, in MIN: 29, 35, 37, &c.

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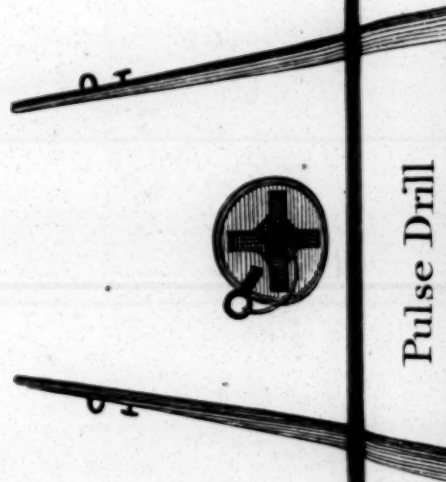
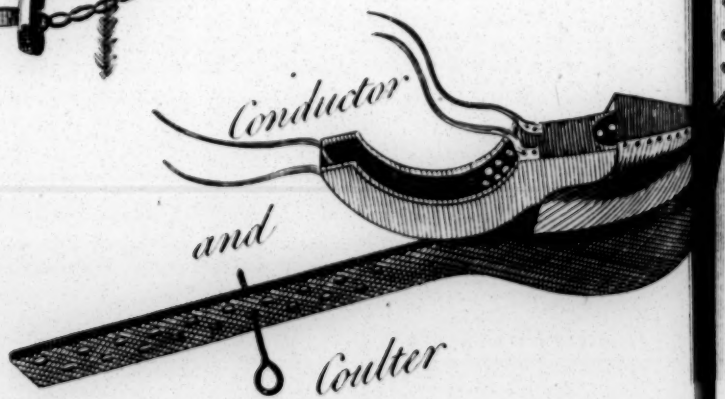
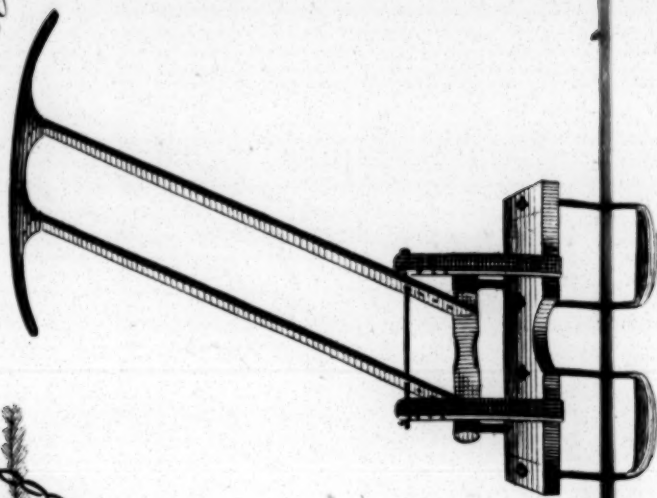
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PLATE. II.



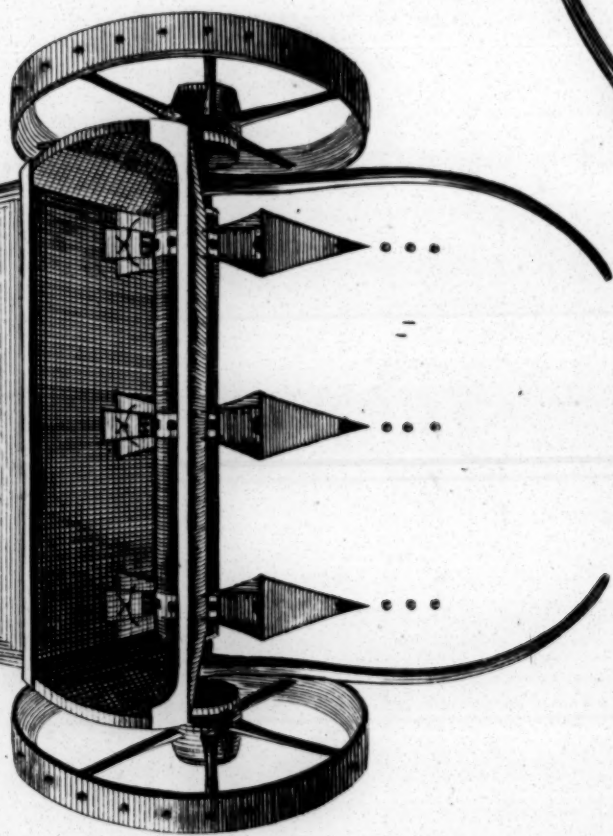
Double Hand Hoe



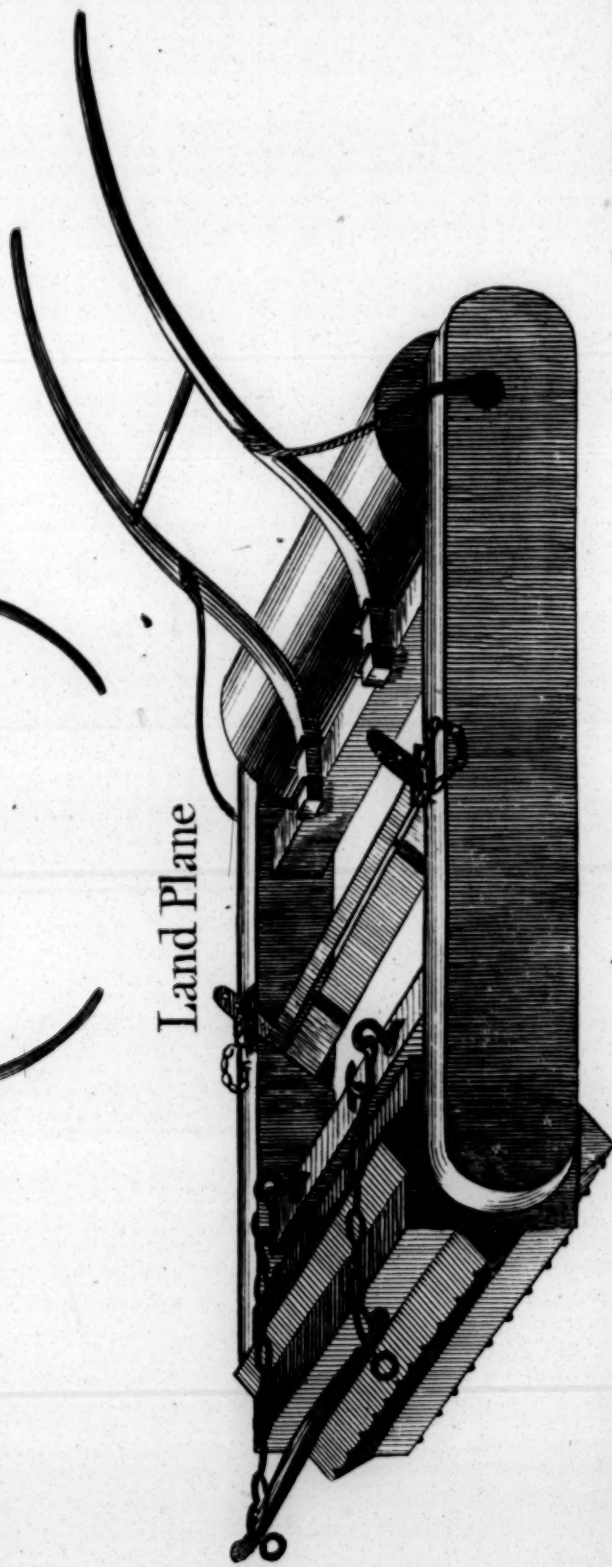
Pulse Drill



Pulse Drill



Land Plane



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to be put in with a Guard, between P. 32 & 33 Vol. II.



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And their use is so obvious, at sight, as not to require farther description.

JANUARY, 1799. For retentive arable lands, which require to be laid up, round, to shoot off rain waters, superficially, these harrows may be safely recommended.

The DOUBLE HAND-HOE. See PLATE II. This is mentioned, in MINUTE 62.

THE DRILL. See PLATE II. This implement is noticed, particularly, in MINUTE 48.

The cells, dints, or dimples, in the roller, receive the peas in the seed box, and deliver them into the conductors: and these convey them, into the cavities of the coulter; which, at once, make the trenches, and deposit the seed. The depth is regulated by the coulter; and the quantity, by the bristle regulators which appear within the seed box.

As it is difficult to fit the bottom of the seed box, so exactly to the roller, as to prevent small peas from escaping between them, the hopper is bottomed with leather, which embraces the roller, and divides it from the peas; except immediately over the dimples.

The coulters pass, obliquely, through the mortises of a strong wooden bar, which goes from shaft to shaft, and is so situated, as just to leave room for the conductors to lie, without being crushed, between the coulters and the roller. (This cross bar, in the drawing, is hid by the hopper or seed box.)

The wheels run on gudgeons, fixed in the roller ; which, on the road, is as inactive, as the axle of a common cart. The method of putting it in action is described, by the small figure between the shafts, in the drawing, which represents the end of the nave, with the axle, &c. The cross, which appears on it, is the washer ; which, instead of being put on, loosely, upon a round, is fitted to the end of the axle, on a square. Upon the road, this washer is of course as inactive as the axle ; but, by inserting a pin, in the end of the nave, between the horns of the washer, the roller no longer remains inactive, but becomes subject to the motion of the wheels. Draw the pin, and the *drill* becomes a *cart*.

At the turnings the whole machine is borne, with ease, from the ground, by the

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man and horse, and consequently no time is lost, nor seed wasted.

JANUARY, 1799. For sowing peas, or beans, on land sufficiently absorbent, to bear treading in the spring, and in rows, at stated distances, (as $16\frac{1}{2}$ inches for peas, and 20 inches for beans) as in the KENTISH PRACTICE, (see SOUTHERN COUNTIES) this implement would be found in some cases preferable, I apprehend, to the *stricking plow* and *seeding box* of KENT.

The SOWING CART. See MINUTES 23, 54, and 61. This implement is on the same principle as the drill; except that the roller is fluted, instead of being dimpled. When the nave pin is inserted, the flutes gather the soot, which presses on the roller, and scatters it on the soil: draw the nave pin, the roller becomes inactive, and the implement, of course, a common cart.

THE LAND PLANE. See PLATE II. See also MINUTE 52.

The octangular roller breaks the large clods; the cross bar (which slides in a groove at each end, and acts in the very

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same manner as the iron of the joiner's plane) takes off the prominences, collects the clods, (which by being kept in agitation before it, are lessened, if not wholly ground down), and leaves them in the dimples and hollow places.—The plain roller closes the operation; leaving the surface of the ground, smooth and even.

If used, merely, as a smoother of the surface, the sliding bar (or bars, it being in two divisions) ought to be set at such a depth, as, in general, to have a collection of mold before it, without suffering the clods to run over the upper division; which mold may, by lifting up the handles, be left wholly, in any particular dip, or hollow place.

In the drawing, it is set, as when passing from field to field.

If used as a pulveriser and compressor of fallows, this acting bar ought to be set deeper; and, if the soil be foul with couch or other obstructions, the upper division (which fits on to two iron pins fixed in the under one) should be taken off, that the mold and rubbish may run over more freely,

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and prevent the load from becoming too heavy for the team.

The longer this implement is made, the leveller it leaves the surface : and the wider, of course the more expeditious. That from which the drawing was made is six feet square.

The octangular roller is made by nailing four triangular slips upon a square piece of timber ; as appears by its end, in the Plate. The other angles are likewise nailed, to prevent their splintering.

JANUARY 1799. This simple, yet versatile, and efficient implement, I have used, in the different parts of the kingdom, in which I have practised ; and this with valuable effect. For levelling rough grounds (especially absorbent lands, intended to lie in a state of grass) ; for forming roads ; and for working fallow grounds (especially where dead soil has been brought to the surface, by levelling, draining, &c.) I have found it highly useful.

It is here described, in its most complicate form. Rollers, in some cases, have their use : but, in general, they are not

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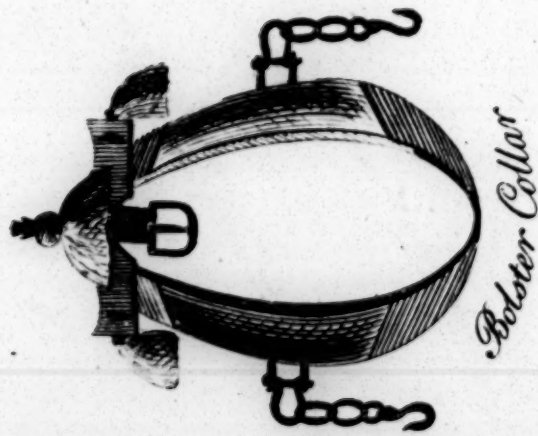
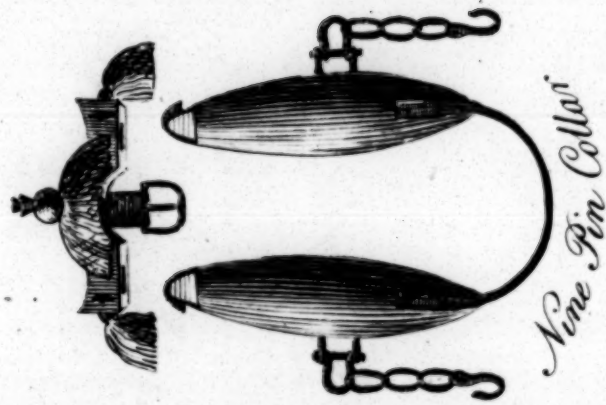
necessary. Two strong side pieces, six or eight feet long; and joined together, by a cross piece, four or five feet long, tenoned into them a foot or more from their ends; with an acting bar, sliding in mortises, near the middle (altogether a rough wooden instrument, that may be made in a few hours, and at a few shillings expence) are the only requisites, for the purposes mentioned; and have invariably formed the land plane I have latterly used.

The only difficulty in forming an implement of this intention, lies in fixing the acting bar, *firmly*; yet, in such a manner, as to be easily *regulated*; so as to fix it at the proper depth, for the given purpose. This I have usually done, by merely forming open or sliding mortises, on the inner sides of the beams, to receive the ends of the acting bar, and fixing it, at the required depth, by driving the points of two long spike nails, through the side pieces, into the ends of the bar.

The position of the acting bar, as well as the form of its *edge*, or lower side, are perfectly similar, to those of the iron of a

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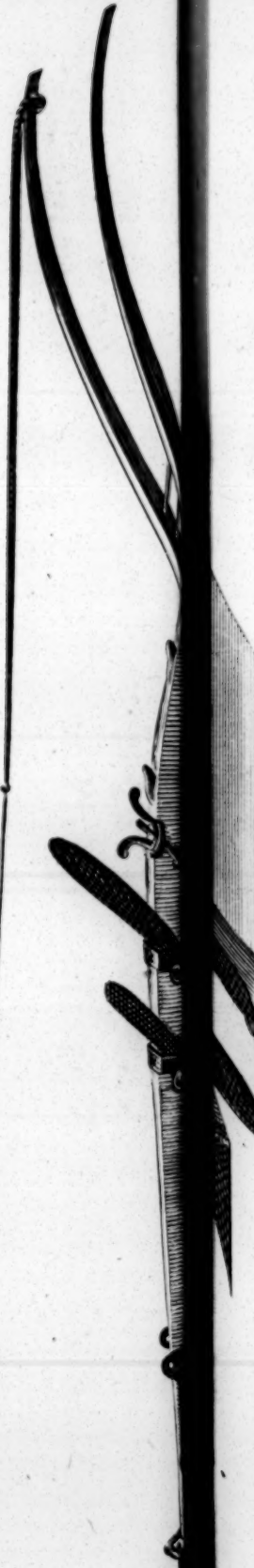
PLATE. III.



Ox Crook



Whip-Rein





The Land Side of the Bury-surface Plow

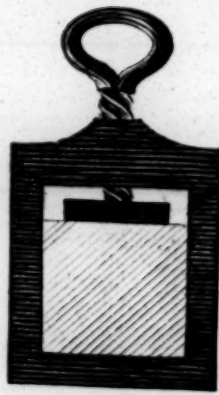


Plow Scratch

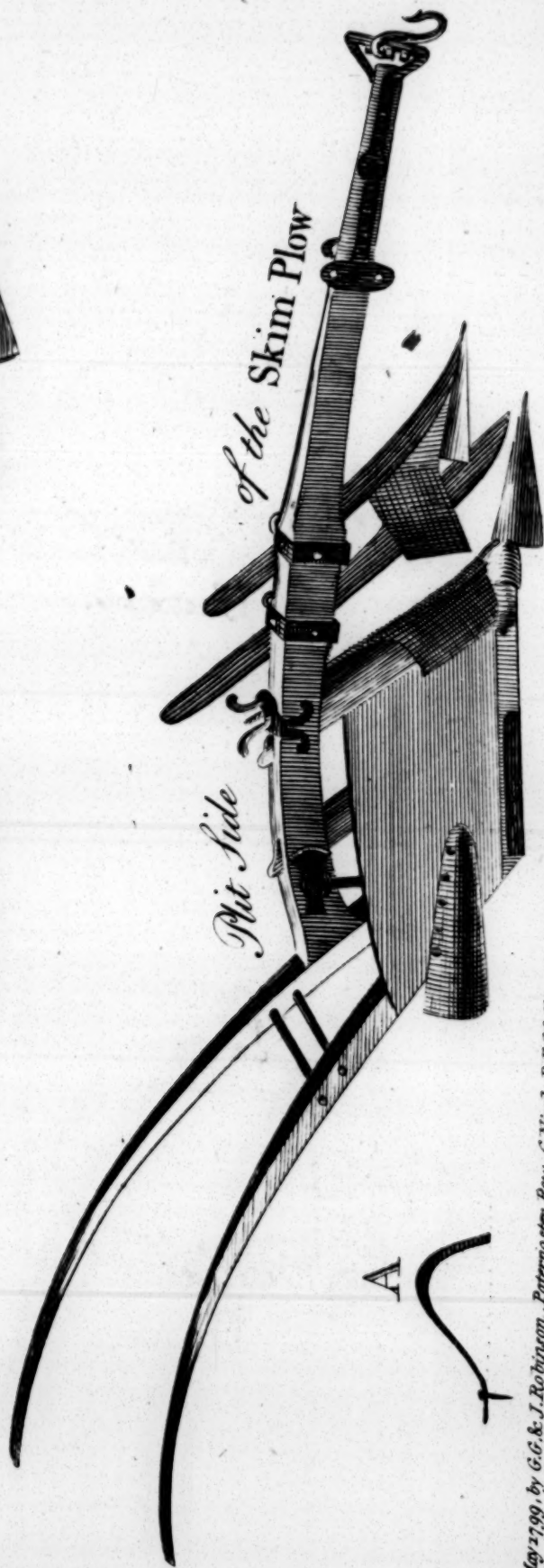
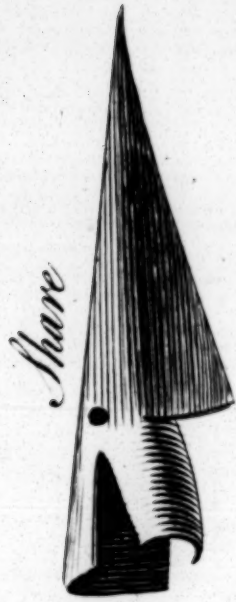


Brace

Skrew-Band



Share



Pit Side

of the Skim Plow



A

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to be put in with a Guard, between P.38 & 39 Vol. II.



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joiner's plane ; which may be considered as its archetype : their modes of operating being the same ; except that the wood PLANE merely shaves off the protuberances ; whereas the LAND PLANE deposits them in the indentures : thus acting, in a twofold manner, to level and smooth the surface.

The OX COLLARS. PLATE III. and MINUTE 76. The nine-pin one is taken in front ; the other shows the side which the ox draws against. The bolster is convex ; and is, in the fullest part, from one to three inches thick, according to the size and shape of the ox's shoulder.

THE OX CROOK. See PLATE III. and MINUTE 98. For leading oxen, whether by the nose ring, or the bit, especially those with long wide horns, this little tool is very useful.

WHIP REINS. See PLATE III. The handles are made of hemp, closely twisted ; with eyes in their but ends, which the plowman holds in his hands, or occasionally puts over the ends of the plow handles. The lashes are made of jack-line, or any similar small cord ; they pass from the

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handles to the outside rings of the bits, through staples or loops in the hames or back-bands; the inner rings of the bits being connected, by a halter, or cord, about three feet long. Their use therefore, as reins, must appear evident; but their use, as whips, may not, at first sight, be so obvious: the stroke can be acquired, by practice only: it is given by a circular motion of the hand, terminating with a sudden jerk, towards the body, downward; not much unlike the motion, which a coachman makes in using his long whip. The whip rein, in the hands of an adept, is equally, if not more terrific, than the whalebone whip. It must be observed, that the whip rein, in the drawing is put upon the handle of the bury-surface plow, merely for the sake of description.

These whip reins are not adapted, solely, to light plows drawn by two horses or oxen each, without drivers, but are equally applicable to harrows, land planes, subplows, &c. &c.

THE PLOW. See PLATE III. This is the swing plow, mentioned in MINUTE 180. And is the best plow, for strong land, which

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requires to be laid up into ridges, with a long team, the Writer has experienced.

With the addition of the BURY-SURFACE, or SKIM PLOW, (which is added, taken away, replaced, or regulated, in a few seconds) it becomes what is improperly termed a *trenching plow**; and for lands of the above description, is the best, perhaps, that has yet been constructed, not only as being expeditiously regulated, but as being unencumbered with wheels.

JANUARY, 1799. This plow is equally applicable to STUBBLE GROUND, and to

* The term, *trenching*, is corruptly borrowed, by agriculture, from gardening. A gardener, before or during winter, buries the surface of his soil, by a layer of *fresh* earth; which, to expose it to the weather, he leaves in ridglets, with trenches between them, and calls the operation, *trenching*. The agricultor, having discovered a method of burying the surface, by a plow, and being in want of a term, copies the gardener, (who also uses it in this corrupt sense) and calls the operation *trenching*, although he leaves no more trench (or trenches) than in a common plowing. The Author hopes that no other apology will be wanted for calling the operation what it really is, burying the surface; and the instrument which assists in performing it, a BURY-SURFACE, or SKIM PLOW.

286. IMPLEMENTS.

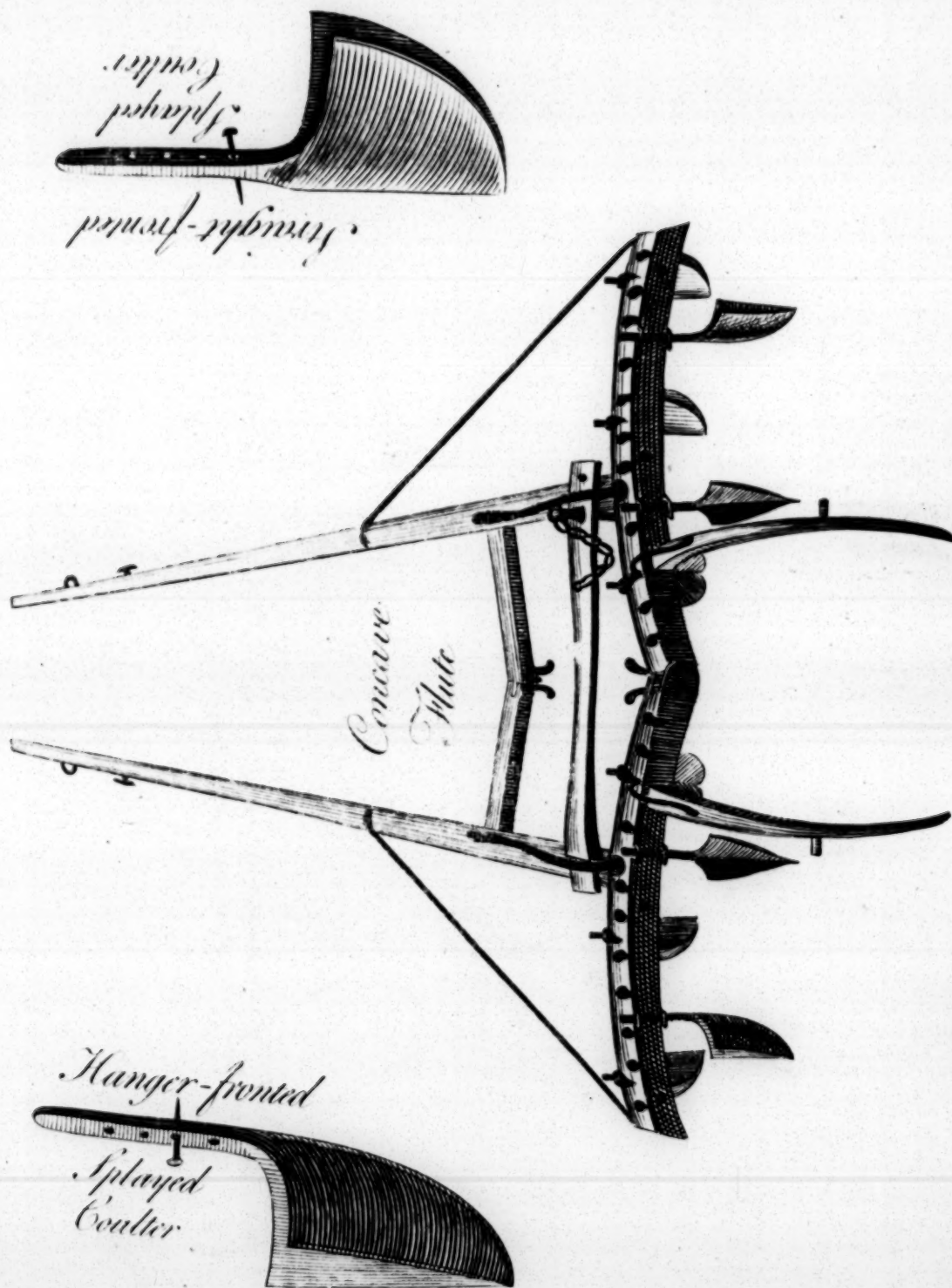
SWARD: and may be used, with advantage, *in all whole ground, intended to be sown on one plowing*; most especially, on STRONG LAND, which requires to be laid up in NARROW RIDGES; and which cannot, in strict accuracy of management, be sown on one plowing, without burying some part of its surface; so as to render the fresh surface friable; as well as to free it from weeds. The advantages gained by it are such as experience alone can testify. See the following OBSERVATIONS, and MIN: 180.

SCREW COULTER BAND. When the Writer first thought of the skrew band, (See MIN. 180.) he applied it to a common beam, with a coulter hole mortised through it; but a mortise weakens the beam, in the part where the greatest strength is required: besides, by placing the coulters on the outside of the beam (where they stand equally firm, as if they passed through a mortise) the land-board, the fore sheath, the brace, the coulter, and the surface plow, stand in a direct line; consequently, the least possible friction is given, and the implement works steadily.

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PLATE. IV.

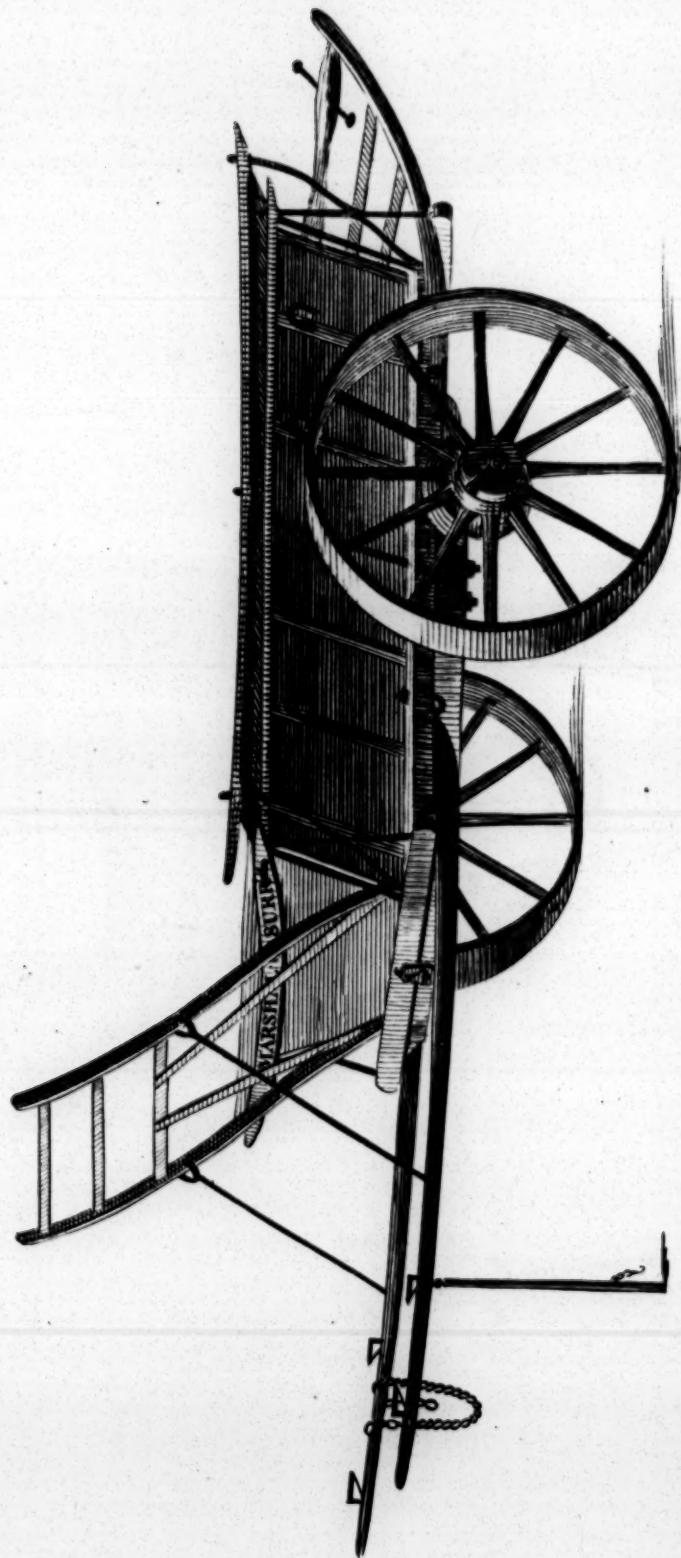


Planting
Quick Sets

*Planting
Duck-sets*



Saw Horse



Published May 27, 1890, by G. & S. J. Robinson, Patrons of the Poor, 6 N. 1st St. and J. Debert, Piccadilly

to be put in with a Girard, between P. 12 & 13 Vol. II.



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286. IMPLEMENTS.

There are two BRACES; one for wet weather (drawn separately), the other for dry weather (drawn on the plow). When a clingy soil is wet, it sticks to iron more than to wood: when any soil is dry, it wears away wood faster than iron.

The coulters are fixed and unfixed, by the handle of the PLOW HATCHET, inserted in the ring or eye of the skrew.

CRESTING IRON (provincially "heel plate.") See Plate III. This appears on the plow, and a section of it is seen, in Fig. A. Its use, in plowing whole ground for a crop, is to force up "crum," or crests of loose mold (with close seedseams between them) for the tines of the harrows to lay hold of, spread, and thereby cover the seed (See MIN: 183.): in this, answering the wrest of the Kentish plow: See SOUTHERN COUNTIES.

It is set, higher or lower, according to the given depth of plowing, or other circumstances.

The FLUTE: See PLATE IV.

The Author claims no originality, in the process of fluting; which is only a new method of performing an old operation. It

is the common practice, of some places in the south of England, to plow early for wheat, and, at seedtime, to harrow down the stale plits, and raise the surface into ridgelets by a kind of "drag." This process has been very much improved, by the ingenious Mr. Ducket, who has invented an implement, which, on his light sandy soil, is admirable; it not only raises the soil into ridgelets, but performs this with such an exactness, as to admit a range of hoes to follow it.*

Nevertheless, as every votary of invention ought to be a votary of fame, the Writer will here declare, as his opinion, that, whether or not the operation had priorly been performed, he should have contrived his carrot drill, and hit upon his barley flute: which, and the crooked lance, led him to the more perfect implement for raising convex beds into broadcast flutes.

The good effect of fluting the two lands, mentioned in Min: 187, led the Writer to make farther experiments on broadcast flutes. But the barley flute being straight,

* See Vol. I. p. 32.

286. IMPLEMENTS.

it was unsuitable to round beds, which evidently require (to flute them longway) a crooked flute. An increase of coulter, to the narrow-cast bean groove (see 9th Nov. 1775.) furnished the implement wanted.

One man, one horse, and a pair of whip reins, are the only requisites. The horse draws in the interfurrow; and, by going twice or thrice in a place, leaves the beds perfectly resembling a range of fluted columns.

BEAN GROOVE. This is the implement last described; with the coulters placed, at suitable distances. See MINUTES 148, 159, &c. &c.

SAW HORSE. See PLATE IV. and MINUTE 160.

THE CART. See PLATE IV. and MINUTE 93. The hasp, which fastens the body of the cart to the shafts, is seen in Fig. A.

287.

R O A D S.

ON a soil, free from obstructions of the plow, roads are readily formed, and com-

287. ROADS.

pletely adjusted, with the plow, the harrow, and the plane.

Clayey roads are wet in winter, and rough in summer ; especially in the former part of it. The latter inconveniency, however, may be obviated at a trifling expence, by running them over with the harrow and the plane, in the critical instant, between wet and dry.

288.

H E D G E S.

THE hedge, the subject of MINUTE 40, has thriven exceedingly well ; except where it was checked, by the remarkable drought of the spring, immediately succeeding the planting. In general, however, it promises a good fence ; and whether or not this mode of planting may be generally recommended, when a new ditch and bank are made, the Writer will venture to recommend the practice, on old banks (to make up breaks, or to continue an old quick

288. HEDGES.

fence), care being taken, to make the trench on the warmer side, and to dig it deep enough, to plant the quicks level with the corn mold. See Plate IV.

289.

DRAINING.

IN making a COMMON SHORE, from the home farmery, through the light, yet retentive, loams of divisions H. and I. the Writer met with a vein of gravel, at the depth of four feet and a half, which serves so completely, as a SUBDRAIN, to the adjoining lands, that the soil, for some short distance from the shore ditch, is already changed, from very retentive, to firm absorbent soil: and this will ever be the case, where a vein of gravel, or a quicksand, is *pricked*. Beside, where there are deep ditches, there are always ready receptacles for surface waters. And, generally, shallow ditches, on a wet-land farm, from which there is a natural fall, are unpardonable.

290.

H A Y I N G.

PERHAPS, generally, if the ground be *cold* and *moist*, break the swaths into light tufts, immediately after the sithe. On the contrary, if the ground be *hot* and *dry*, leave the swaths, awhile, to wither ; and, then, break them, at once, into beds ;—turn, until dry ;—and carry without cocking.

But, be the ground hot or cold, dry or moist, and the weather settled or unsettled, do not stack the hay, until it be *rustingly dry*. For if it be put together, cold and flaccid, it will come out mouldy, musty, or at least *dusty*, and be void of flavor.

And generally, there is more danger of hay being spoilt in the stack, than in the field ; especially if kept from the ground, in cocks suitable to its state of dryness.

291.

MIXED HERBAGE.

BY this is meant a compound of white clover, ribgrass, or plantain, and trefoil. This mixture is not fixed on, as the most excellent; but one whose ingredients are easily procured. There are, no doubt, other herbaceous plants, which are equally eligible to be cultivated, and were their seeds sold currently, at the shops, they would, doubtless, be adopted, as valuable acquisitions.

292.

COURSE OF PRACTICE.

MUCH, no doubt, depends on a judicious CHANGE OF CROPS. To suffer any species of crop to succeed itself, without some intermediate melioration, is generally bad

292. COURSE OF PRACTICE.

management. *Corn* after *corn*, perhaps, is seldom good: * even *grain* after *grain*, without dung, or an intervening fallow, is perhaps, seldom eligible. †

A regular ROTATION, of crops and fallows, is, perhaps, more *convenient* than *profitable*: for, perhaps, the more VARIETY OF CROPS, the less vegetable food will remain useless, in the soil; for, perhaps, every vegetable, as every animal, has its *favorite* food.

293.

SOILS PROPER FOR WHEAT.

THE MINUTES are silent, on this head. It is indeed a difficult subject, on which to make comparative experiments and observations; different soils being variously acted upon, by the same weather. Nothing but a series of experiments can be decisive.

It would, doubtless, be useful, in esti-

* Yet see the practice of NORFOLK.

† Unless one of them be PULSE, cultivated in rows, with wide intervals, as a FALLOW CROP.

293. SOILS FOR WHEAT.

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mating the value of land, to know the degree of affection which wheat bears to each species of soils. The Writer, however, is clearly of opinion, that the crop depends, more, on the WEATHER, MANURE, and TILLAGE, than on the SPECIFIC QUALITY of the SOIL. (And see the following OBSERVATIONS.)

294.

ASSISTANT SCIENCES.

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TO BECOME a proficient, in the SCIENCE of AGRICULTURE, the student should be acquainted with the rudiments, at least, of natural philosophy, particularly, with the philosophy of the weather. He should, likewise, have a knowledge of natural history. He ought to be master of fossilogy, so far as it relates to soils; and of chemistry, as it pertains to manures. He ought to be acquainted, with botany, and the vegetable economy; as also with zoography, and the animal economy; with a competent knowledge of the theory and practice

294. ASSISTANT SCIENCES.

of farriery. Nor should he be unacquainted with moral philosophy, to assist him in the management of servants: nor with mechanics, and the theory of invention, to help him in the construction of his implements. Surveying, too, would assist him in the division and classing of his farm, as well as in making experiments; and an adequate idea of accountantship would be useful to him, in every department of management.

295.

HAZARD OF FARMING.

NEW as this article may be, to written agriculture, it has ever been known, full well, to practical farmers. The theorist, who is desirous to be convinced of its reality, may depend on the authenticity of the foregoing Minutes. Should he still doubt, he may himself become practitioner.

The Writer expects blame, from enthusiastic theorists, for telling tales, which blacken

the cause of agriculture. The truth is, he was so attentive to his favorite motto,

Truth is always valuable,

that he did not, more than once, advert to the consequences, which may attend the publication of SCIENTIFIC TRUTH, whatever may be their hue.

But the crime committed, reflections follow of course. Suppose these Minutes should fall into the hands of the *sinking* man, will it induce him to catch at agriculture, as the twig of salvation? No. Suppose the fluttering speculatist should chance to settle, on the haggard page, will it invite him to the field of agriculture, in search of golden clods? No. But suppose the novitiate scientist should peruse it with attention, what impression will he receive? He will be struck with the appearance of an article, which he had never heard of, in his ideal account of profit and loss; which account he will find somewhat deranged; and a few minutes reflection will point out to him, that the only means of re-adjusting it, will be, by a deductory transfer, from rent and taxes. Lastly, suppose this sable

295. HAZARD OF FARMING.

list should fortunately catch the eye of the landed gentleman, will it not assist in effacing those false ideas, which he has recently formed, of the value of his lands? will it not make him a happier landlord, by increasing his good opinion of the industry of his tenants? nay, may it not prevent an intended rise of rent, which would at once have brought ruin on the tenant, with shame and disgrace on his landlord? The Author hopes and trusts it may!

JANUARY 1799. The above was written, at a time when the volatile spirit of Agriculture was high on the wing,—shedding down its baleful influence, on the heads of the industrious and deserving. Of later years, men of landed property, having seen into the folly of “improving estates,” by racking the rent rolls! have been induced to attend, personally, to their own concerns; and have found, that there is a certain point which cannot be passed, with impunity, and that excessive rents are eventually ruinous to an estate.

296.

PUBLIC AGRICULTURE.

PUBLIC and private agriculture have generally been confounded, by agricultural writers; who, to add dignity to their subject, have mounted the stately steed of public good; and, in their lofty career, have cavalierly trodden under-foot the good of individuals;—who have only been considered, as the implements of public agriculture.

The Author has, hitherto, kept his eye on the farmer; he will now, for a moment, look up to the state, and speak his sentiments on Public Agriculture.

He has already, in a Minute of the 10th of June, 1777, spoken of observators of agriculture; he now means to speak of AGRICULTURAL COLLEGES: not as the institutions of particular societies, but as the foundations of society at large.

Learning and taste are the ornaments of a state:—but what avail the rose trees and

296. PUBLIC AGRICULTURE.

daisies, which grow on the counterscarp, when the garrison is assailed? Navigation and agriculture are the bulwarks of this country.

What are the essentials of the happiness of mankind?

Food.

Health.

Cloathing.

Liberty.

Shelter.

Morality.

Communication.

Is not human happiness the test of useful knowledge? Ought not the education of individuals to be, in some measure, subservient to the happiness of the species? Would not some certain number of establishments, bearing resemblance to the outlines hereafter sketched out, be ornaments of the present, and securities of ensuing ages? Nay, might they not give permanency to this people, as a free and great nation, until the earth may no longer trace its present orbit?

I. Let AGRICULTURE be the PRIMARY OBJECT of these establishments. Admit all degrees of men, from the peasant to the prince. Let each student handle the plow, wield the prong and flail, and eat

the bread he has aided Nature in producing.

II. To furnish the students with adequate ideas of the MANUFACTURES of their country, and to show them the various operations, which are necessary to the comforts and embellishments of dress, let the fleece be shorn, from the sheep they have kept ; let the wool be prepared, the yarn spun, the web wove, dyed, and finished, under their immediate eye, and with their manual assistance. Let the flax, too, which they have raised, pass through the various processes of manufacture : let the hide, which they have caressed, be prepared ;—and let the fur from the game they have pursued, be raised, by manufacture, into an honorary ornament. Let every other necessary, and decency of dress be prepared, and let each student wear the vestments, he has more or less assisted in manufacturing.

III. A turfen hut might screen us from the tempest ; and, in a state of nature, might be adequate to human happiness. But, in the present state of society in civilized nations, the necessities of life are not

more essential to happiness, than are its conveniences. Beside, the stately mansion adds dignity to the nation it is reared among: public edifices are still greater proofs of national munificence. The great design, too, enlarges the mind of the architect, and the execution athleticates the body of the laborer. The theory of ARCHITECTURE, therefore, ought not to be neglected. But let it be such architecture as may convey moral lessons, to the minds of the students: let ingenuity give place to simplicity, and elegance to greatness.

IV. Let the ENGLISH LANGUAGE form a principal part of their studies: let it be considered as an INDEPENDANT LANGUAGE, which is still in a state of improvement, and will yet admit of many embellishments; and let every science, which can add to the FACILITY and PERSPICUITY of communication, be added to this important article of the essentials of human happiness.

V. Let anatomy and the animal economy, physic and surgery, be explained. Let the nonnaturals form a principal study, and thereby inculcate the *prevention* of diseases.

VI. Let each college be a regular fortification ; supplied with artillery, arms, and ammunition : let every student be a SOLDIER : let regular guard be kept, and field days be observed : let tactics and fortification be their studies ; racing, wrestling, boxing, fencing, and swimming, be the relaxations of this department.

But it is not enough for Englishmen to stem the torrent of foreign invasion : the invasions of ambition must likewise be repelled. The law of nature,—the law of nations,—the laws of the community,—and the history of fallen states, should therefore be inculcated,—that Britons may descry and check tyranny in the bud.

VII. Let each college be a court of moral justice : let virtue be borne in triumph, and vice punished, without reluctance : let ethics be taught in their fullest extent ; and let this leading truth be inculcated.

On liberty without licentiousness, and subordination without passive obedience, rests the welfare of communities, and the happiness of individuals : resignation is due to Providence,—and to Providence alone.

That truth may be traced, with precision, let the mathematics be taught : let astronomy, geology, and the minutiae of creation be disclosed, that God may be evinced, by the records of nature.

Let the seedtime and harvest be announced with solemnity, and closed with rejoicings. Let the winter solstice be a festival : the vernal equinox a day of mirth : the summer solstice a libation ; the autumnal equinox a day of gratitude.*

* JAN: 1799. In the first edition of these Remarks, I added an eighth essential of human happiness, (though in reality a branch of the last) : and, in every stage of civilization, GOOD MANNERS may well be considered as such. But addressing a highly civilized public, at a time when the *refinement* of manners was a popular topic, I suggested the following sentiments.

“ EMBELLISHMENTS. Exclude not the graces from these temples of manhood. Let the laws of good breeding be taught as a science ; and let the circle of mixed society, the ball room, and the theatre, add the more technical graces of politeness. Not the the punctilio and grimace—of Charlatans in society ; nor the studied finesse of a C———d : but the *natural* complacency, the simplicity of manner, and frankness of address, which spontaneously flow from manly and liberal sentiments, when meliorated in the more polished circles of society.”

GENERALLY, let AGRICULTURE form the bases of these establishments: let its processes and improvements be considered, as the daily care of the professors, and the employment of the students; to whom the other departments may serve as relaxations.

Let experiments and observations be carefully made, and duly registered; and let a reciprocal communication be kept up, between the several colleges: in order that, when an IMPROVEMENT has been discovered, and deliberately tested, by any one, it may be readily communicated to the rest, and, through their means, to the leading men of the profession, in the adjacent districts.

JANUARY, 1799. These reflections were originally published, to show, that, strenuous advocate as I might appear to be for professional agriculture, I had not been altogether unattentive to the public welfare. And so far as they relate to *agriculture*, they contain my present sentiments, with little alteration.

In 1790, in the MIDLAND COUNTIES, I farther explained my ideas, respecting a

296. PUBLIC AGRICULTURE.

PUBLIC ESTABLISHMENT of AGRICULTURE.*

Since that time, I have bent my mind, particularly, towards this subject : and, when a PERMANENT FOUNDATION is laid, either by public or private munificence, I am ready to use my best endeavors, in raising the superstructure ; and this, most willingly, if I might have the honor of acting under a PATRONAGE, which I have long been ambitious to obtain.

297.

AGRICULTURAL
KNOWLEDGE.

THE sources of agricultural knowledge are various. By the private agriculturist, however, they are principally divisible, into self experience, and the experience of others.

Self experience is gained, by analysis, by experiment, or by attentive observation ;—

* See VOL. I. sect. FARMERS.

297. AGRICULTURAL KNOWLEDGE.

either on self practice, or on the practice of others.

The experience of others may be acquired, by parole, or by written evidence.

From the slow progress which agricultural knowledge has heretofore made, under the guidance of the illiterate, it seems but reasonable to infer, that letters may be made usefully subservient to its advancement. Beside, memory is frequently treacherous, it is, at all times, fallible; and, perhaps, it is not, in any man, equal to the retainment of the extent of knowledge, requisite to an accurate practice of agriculture. And the pen seems not less necessary to farming, than it is to any other difficult art or science.

298.

WORKING ON SUNDAYS.

THE author did not commence farming, with a *premeditated* intent on sabbath-breaking: he reveres the laws of men,

298. WORKING ON SUNDAYS.

whether they are religious, or professedly political, when the laws of men are founded on the law of nature : nay, he can allow for the misconceptions of human frailty, and venerate the *inoffensive* law of custom, though established in error. But when the law of man is evidently subversive of the first ordinance of nature (by efficiently and wilfully destroying the means of his own subsistence) what unprejudiced man can hesitate to condemn it ? at least in his own mind.

Nor did the Writer begin the practice of working on Sundays, *precipitately* ; but was deliberately convinced of its propriety, by a series of circumstances, and a train of reflections.

The first year, he saw his hay lose its essence, and his corn its wholesomeness, with passive obedience to the laws and religion of his country.

The second year, perceiving, more evidently, the mischievousness of a custom, which counteracts the bounteous intentions of Omniscience, he began to reflect on the consequences, which would result, from a

298. WORKING ON SUNDAYS.

non-compliance; and sifted, particularly, into the sabbath-day employments of his weekly servants.

One, he found digging in his garden :— another, quarrelling with his neighbor :— a third, gambling :—a fourth, blaspheming his Maker ; by way of amusing the hour of indolence: the rest at the alehouse, squandering those wages, which ought to have administered comfort, to themselves, their wives, and their children, through the the ensuing week.

The wane of harvest of 1775, was uncommonly precarious, and the impropriety (not to say the impiety) of neglecting any opportunity, which might preserve the gifts of nature from actual waste, was painted in such striking colors, that he no longer hesitated to listen, to the dictates of nature, reason, and common sense.

The more he practised the working on Sundays, in HAYTIME and HARVEST, the more clearly he saw its propriety: he eagerly wished to see it the common practice of his country ; and was ambitious to set the PATRIOTIC EXAMPLE.

298. WORKING ON SUNDAYS.

His intentions, however, were not seen so clearly, by his neighbors, as by himself; and he incurred the censure of some, whose good opinion he wished not to have forfeited.

The circumstance, which gave the greatest offence, happened since the close of the foregoing Minutes: nevertheless, in support of his conduct, he will here insert, though out of form, a series of Minutes, on working on Sundays, made during the backward haytime, and the harvest, of 1777.

Sunday, 3 August, 1777. Last Sunday, the meadow hay was in swath, and might *then* have been cocked: no opportunity of cocking has *since* occurred, and it is *now* yellow, and almost rotten. It is true, I was sacrilegious enough to turn some, which was then spoiling; but the men appeared to think it wrong; and, today, I did not venture to ask their assistance.

Tuesday, 5 Aug.—It may be good policy, in a state, to have days of relaxation; but, surely, these days ought not to interfere, with the edicts of nature: it cannot be good policy, in the members of any state, to

abandon the means of their own preservation.

Had the hay, mentioned, (see the 3d.) been then shook into small cocks, it would have been ready to *carry, yesterday*; but it was obliged to be *made, yesterday*, and instead of being aired, and carried, it was caught in the rain of today!

Sunday, 7th Sept.—The last week has been slow harvest weather; except yesterday, which was very fine.

We had, this morning, about thirty loads of wheat,—thirty loads of oats,—fifteen loads of barley,—and twenty acres of second cut of clover, down; and, most of them, fit to be carried.

The month of September is uncertain harvest weather: the days grow short;—the dews remain long on the ground; the fogs frequently hang on, till noon; and, until past the middle of the month, the weather is generally, squally, and uncertain.

Last night, the sun set well, and there was every other appearance of a fine day succeeding. I promised every man, who would work, in case of a fine day, two shil-

lings, and as much roast beef and plum pudding as he would eat, with as much ale as it might be fit for him to drink.

Today, (which has been transcendantly fine) nine men,—three boys,—three teams,—and four carriages, have made a wheat stack, of eighteen harvest loads,—and have also put two or three loads of clover, into stack,—in exceedingly high order.

I am sincerely thankful, for so favourable an opportunity of setting the patriotic example, which I have long been desirous to offer; especially when I reflect, that not one *sober* man has, yet, condemned my conduct.

I am not, however, so sanguine, as to think, that no sober man will condemn me,—if an enthusiast can be called sober. But I trust, that every sober man of sense must applaud me, in his own mind: for it is not vague reasoning to say, that some hundreds—some thousands—of quarters of corn will be spoiled, or damaged, because farmers, in general, have not embraced this heavenly day, to rescue their crops from the uncertainty of the weather, at this season of the year.

Wednesday, 10th Sept.—Strange! the whole country is agitated, and men in their sober senses think it was not quite right. Let me take a retrospect;—look into my motives; and see if I have *really* offended nature, reason, or common sense.

Was not self interest the first mover?—It could not: there was a certain loss, of at least a guinea, without any certain gain;* a chance of gain, indeed, might influence; but this was not my prime motive.

Was a contempt of religion the stimulus? No: I revere every religion which teaches morality, and instils a grateful regard of that bountiful Power, to which we owe our existence.

And, on the maturest reflection, I am confident, beyond a doubt, PHILANTHROPY was my leading motive: my leading principle was the increase of the quantity, and the decrease of the price of wholesome bread.

But what mighty difference will one stack make in the assize of bread? Ridi-

* The harvest month being up (see a note under 2 Sept. '76), the same men would have done the same work, on Monday, for 20*d.* a day, wages only.

298. WORKING ON SUNDAYS.

culous! It is not meant that the saving of one stack, nor of twenty stacks, would affect it, sensibly; but, were it the universal practice, of every farmer, in every year, to work on Sundays, in July, August, and the beginning of September, who will deny that the community would be benefited? And, I declare,—nay, I will swear by the sacred laws of nature, or by the holy tenets of any religion, now existing, or which ever did exist,—that it was the *EXAMPLE* I principally meant to hold out. And, although it has met with the censure of some, I hope it will meet with the approbation of the many, and that working on Sundays, in seedtimes and harvest, will become the universal practice of English agriculturalists.*

* Since writing the above, the Author has been informed, that an old law exists (mentioned by Dugdale), which tolerates husbandmen, in working on Sundays, in harvest: and that, in proof thereof, a gentleman in the north, has uniformly carried one load, every year, on a Sunday.

JAN: 1799. The particulars of this note were furnished, by the late Dr. SAMUEL JOHNSON: at whose request, some considerable part, of what was originally written, and *printed*, on this subject, was cancelled.

That which was *published*, and which is now offered

299.

POLITICAL ECONOMY.

IN a state of nature, the surface of the earth is common:—land marks are unknown.

In a state of property, each landowner cultivates his own share, or lends it, conditionally, to another, to cultivate.

England has long been in a state of property, and the rental value of land has long been ascertained.

The rent of land will ever be proportionate to the prices of its produce: for, if the prices of produce rise, the tenant becomes

again to the public, is, *in effect*, what Dr. Johnson approved; or, let me put it in the most cautious terms, that of which *Dr. Johnson did not disapprove*. A fact which I mention with greater readiness, as I believe it will have some weight, with those who may have thought the practice, here recommended, improper to be generally adopted.

too low-rented : the landlord perceives this, and raises him.—The rise being universal, the prices of produce become, in some measure, fixed, at the advanced rates ; for the farmer must keep up his prices, or forfeit his farm. On the contrary, if farmers, in general, are too high-rented, land owners must lower their rents, or the farmers must raise the prices of produce, or consign themselves to ruin.

The prices of labor must ever be proportionate to the prices of provisions ; for the laborer, like the farmer, will consult the means of his own preservation, let the consequence to the community be what it may.

The prices of manufactures must ever keep pace with the prices of labor : the temporary influence of improvements apart. This, *in a general light*, is too obvious to admit of argument.

The exportation of manufactures is, more or less, influenced, by their prices ; for suppose any particular article to be the manufacture of two distinct countries, and that a third country has a demand for this article, will not this third country apply to

that market, at which it can be supplied the cheapest ?

England owes her *present splendor* to her manufactures : and, considering manufactures as the promoters of navigation, to manufactures, in some measure, she owes her strength.

Is it, then, for Englishmen to preach up a rise of rent ! For Englishmen to blast the strength and splendor of Great Britain ! May shame confound such preachers, and oblivion, without delay, swallow up, at once, their folly, and their sermons !

300.

R E N T.

BY the PRIVATE AGRICULTURIST, the rent of land must be viewed in a different light. (See the last Remark.)

Landlords and tenants must be considered, as two distinct bodies of men ; holding interests, distinct, and opposite.

300. RENT.

In a state of money, self interest is self preservation; for money is the mean of subsistence: consequently, money is the object of landlord and tenant.

If a landowner sell his estate, he sells it to the man, who offers the most money; and, on the same principle, if he let a part of his estate, he lets it to the man, who will give the most rent.*

If a tenant want a farm, he is actuated by the same principle: he looks round the country, and pitches upon the farm he can rent the cheapest.

Therefore—every farm, which is let, *publicly*, on a fresh lease, to a fresh tenant,

* JAN: 1799. At the time the above was written, this false principle of letting farms was pretty generally received: being feelingly urged by some professional Charlatans, who flourished about that time. But a better principle has since been adopted; especially by those who have experienced the inconveniences, arising from nominal rents which were never paid; and who, now, more wisely, as well as liberally, fix the rent, at a fair market price, and choose the tenant.

For farther remarks, on this subject, see WEST OF ENGLAND; Art: LETTING FARMS.

300. RENT.

is let, precisely, or nearly, at its rental value; that is, nearly in proportion to the present or recent prices of produce.

But the prices of produce are fluctuating; and although, in England, the rise may have been pretty regular, if taken century after century; yet, viewed year after year, an irregular rise and fall would be perceived: this, indeed, must necessarily be the case; for although the prices of land, and the prices of its produce, may never lose sight of each other; yet the prices of the current year depend on a variety of circumstances; which circumstances may not be annual, but may last through a series of years. Therefore—the tenant who leases a farm, after a fall, or during a long stagnation of prices, rents it to advantage; while he who takes one, during, or immediately after, a rapid rise, most probably rents it too dear.

Within the last five and twenty years, the prices of produce have had a rapid rise, in England, and the farmers, who had long leases unexpired, have been acquiring

300. RENT.

wealth;* the consequence of which is a rapid rise of rent.

In the year 1774 (and for some years preceding), wheat was sold for 6os. a quarter, more or less: and farms, in general, have, since then, been let at that rate: notwithstanding wheat is now, and has almost ever since been, under 5os. a quarter.

What must be the consequence? one of these: the landlord must reduce his rent, to under 5os. a quarter; or the tenant must re-advance the prices of his wheat, to 6os.

* But, perhaps, not so abundantly, as is generally imagined: some *few*, no doubt, have amassed fortunes; but, more generally, this has been the state of the case: the farmer has had a *good thing*; that is, he has been artful enough to take a farm, clandestinely; or has had the good fortune to take one, when the prices of produce have been low; added to this, he has worked hard, lived penuriously, and, when luck has smiled upon him, has “put out” forty or fifty pounds, a year. At the expiration of twenty or thirty years, he finds himself worth (independent of his farming capital, a great part of which he of course set out with) the enormous sum of a thousand pounds! He therefore buys himself a decent suit, his wife a riding habit, and each of them a nag to ride to market on; and thus gets the name of being worth a “world of money.”

300. RENT.

a quarter ; or, he must annually sink a part of his capital.*

Some landlords may, but landlords in general will not, reduce their lease rents. The farmer cannot, as yet, re-advance his produce (for many leases, much cheaper than his, are still unexpired) : and the writer will venture to predict, that the farmer who has taken a long lease, of a large farm, within the last three years, the letting of which has been publicly known, has laid the foundation of his own, and his family's ruin.†

* Wheat is here used, in a figurative sense, for the general produce of a farm.

† JAN: 1799. This prediction, though not confirmed, to the ruinous extent that was apprehended, proved too true, in numerous instances, which came within my knowledge : and that it was not fulfilled, to the utmost, was owing to a mere point of police.

Who, in year 1777, when a wretch that had coined a few shillings, no matter as to the urgency of the occasion, was dragged to the gallows for the crime, could have divined, that the act of coining thousands should become an innocent employment ? what farmer could then foresee, that the time was at hand, when he should be able to purchase stock in the market, and even to pay his rent, with the very rags, perhaps, which he had

300. RENT.

The Author has spoken, *generally*, throughout this and the preceding article. His sentiments are briefly these: the farmer's loss or gain rests, principally, on his rent: and, on the rate of rent depends, not only the reward of the farmer's toil; but, in some measure, THE WELFARE OF THIS ISLAND. If he is wrong, he will thank, sincerely, the man who will set him right.

Two of the requisites of good management are SKILL, and INDUSTRY:* and that the *majority* of farmers are an *industrious* set of people will not—cannot—be denied. But that there are many drunken, idle, improvident farmers is as true, as that there

seen, a few months before, on the backs of his workmen? not manufactured into government securities, for the benefit, or to answer the exigences, of the state: but ushered into circulation, by one of his neighbours. (For the evil tendency of this practice, see YORKSHIRE, sect: MARKETS.)

It is not the increase of the value of land (especially in this part of the Island) but the decrease of the value of money, that has enabled farmers to pay the excessive rents, which were, at that time, imposed upon them.

* JAN: 1799. CAPITAL is a third requisite; though rarely considered, in the letting of farm lands.

300. RENT.

are drunken, idle, improvident mechanics, tradesmen, and merchants; and dissipated, improvident men of fashion. Thus, the son frequently sinks the few hundreds his father has scraped together, on the identical farm, which now, falls into the hands of a third person; who, at the identical rent, makes a farmer's fortune upon it: not by his superior skill;—for the son may be supposed to have had the skill of his father;—but by his superior industry.

On the whole,—if, among the great bulk of occupiers, skill is hereditary, and industry the force of habit,—if manure cannot be purchased, under its full value, and if the prices of labor are settled, what can influence the farmer's interest, considerably, rent excepted? For let him plant, drill, or sow broadcast, the soil will throw out a crop, in proportion to its intrinsic value, assisted by the manure and the tillage it has received.

Before he close this head, he will give a sketch of one of those few farmers, who have really made fortunes by farming; and one who farmed, on the verge of this parish.

300. RENT.

This industrious man left his son a fortune of ten, fifteen, or twenty thousand pounds: suppose fifteen thousand pounds. He held two or three farms, on different terms: suppose he occupied, on a par, 800 acres, at 7s. an acre, during 40 years. This, if not the truth, is sufficiently near it, on which to found the following calculations.

If, in 40 years, he gained £15,000. he cleared (setting aside the interest, and original capital) £375. a year; besides paying his rent and taxes:

800 acres at 7s. amount to	£. 280 0 0
Suppose the tenants' taxes, at	
3s. in the pound, -	42 0 0
	£. 322 0 0

His farms, therefore, produced, independent of labor, manure, seed, tithe, personal expences, &c. £697. a year.

Suppose he had paid 14s. an acre:

800 acres at 14s. -	£. 560 0 0
Taxes, on £560. at 3s. -	84 0 0
	£. 644 0 0

which, taken from £697. leaves £53. his

300. RENT.

yearly saving, which, in 40 years, amounts to £2,120. the fortune he would, at 14s. an acre, have left his son.

Suppose he had paid 28s. an acre:

800 acres, at 28s. - £. 1120 0 0

Taxes, on £1120. at 3s. - 168 0 0

£. 1288 0 0

which cannot be deducted from £697. This, however, may be taken from £1288. and thus leave a *loss* of £591. a year! Consequently, had this *industrious* man, *skilful* as he was, begun with a capital, of even fifteen or twenty thousand pounds, he must, before the expiration of forty years, have been reduced to beggary!

301.

ACCOUNTS.

Accountantship is the oracle of the private agriculturist. A farmer, it is true, may, in a course of years, know, by his purse, whether he gains or loses, in the gross, by

FARM DIARY, OR WEEKL

March, 1777.	Monday, 24.	Tuesday, 25.	Wednesday, 26.	Thursda
Ox team,	Doubling A 5.	f.(a) doubling A 5.	b.(b) doubling A 4.	Doubling
1st. Horse team,	Harrowing B 3.	b. Reversing B 4.	Reversing B 4.	Reversing
2nd. Horse team,	Carried Hay to—	Harrowing G 1.	Pulvering (c) G 1.	Carried H
* * *				* *
Duffel (Oxen),				
Miles (Horses),				
Rivers (Horses),				
Boy Smith (Oxen),				
Boy Miles (Horses),				
Boy Smale (Cows, Hogs,)		Cow n ^o . 3. calved.		
* * *				* *
Bade, (Foreman),	Sow ^g . Oats in B 3.	Sow ^g . Oats in G 1.		
Caper (Labourer),	Gapping.	(odd Horses)	(odd Horses, &c.)	Binding I
Ratford,	Fenc ^g . B. R—ll's (d)	Fenc ^g . B. R—ll's.	Fenc ^g . B. R—ll's.	Fenc ^g . B.
King,	ditto	ditto	ditto.	dit
Gregory,	Thrashing Oats.	Thrashing Oats.	Thrashing Oats.	Thrashin
Richardson,	ditto	ditto.	ditto.	dit
Kinnaby,	Prun ^g . A 3 A 4 (d)	Gapping.	Prun ^g . A 4.—A 5.	Cutting I
				Gregory

- (a) Finished throwing two five-bout beds into one : this being inter
 (b) Began.
 (c) Lightly rolling, and re-harrowing.
 (d,d) Making the fence between the division B. and Farmer R—ll's
 (e) The carters have 6d. extraordinary for their Sunday's attendance
 (f) These men work by the rod, and have not finished their job ; th
 on account. It is here written in short, that the whole may stand tog

☞ A large folio book, with the first four columns on the left hand,
 the most convenient Diary.

WEEKLY JOURNAL.

To face page 82. Vol. II.

6.	Thursday, 27.	Friday, 28.	Saturday, 29.	Labor Account.
4.	Doubling A 4.	Doubling A 4.	Doubling A 4.	
	Reversing B 4.	Reversing B 4.	f. Reversing B 4.	
1.	Carried Hay to—	Harrowing F 2.	Distribg. Bushes.	
	* * *		and Harrowg. A 5.	
				Week (e)
				Ditto.
				Ditto.
				Ditto.
				Ditto.
		Sow, n ^o 1. farrowed.		In-door Serv ^t .
	* * *			
		f.sowg. tare barley.	Sowing Oats in A.	In-door Serv ^t .
c.)	Binding Hay, &c.	(odd Horses.)	Gapping.	By the Week.
1's.	Fencg. B. R—ll's.	Fencg. B. R—ll's.	Fencg. B. R—ll's.	10s. 6d.
	ditto.	ditto.	ditto.	10s. 6d. (f)
s.	Thrashing Oats.	Thrashing Oats.	Making up Oats.	See below.
	ditto.	ditto.	ditto.	ditto.
A 5.	Cutting Bushes.	Cutting Bushes.	Loadg. Bushes, &c.	By the Week.
	Gregory and Pr.	for Thrashing.	11 $\frac{3}{8}$ qrs. of Oats.	at 22d.
				£ 1. 1s. 0d.

is being intended for a ley.

farmer R—ll's fields, and pruning that between A 3. and A 4.
y's attendance.

their job; they therefore each of them receive half a guinea,
may stand together, when they are paid in full.

the left hand, and the last four on the right hand, page, makes

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301. ACCOUNTS.

This DIARY not only exhibits a brief, yet circumstantial, history of the business of a farm (each column showing the several works going forward, on each day of every year, with the number of teams and men, employed, in carrying them on), and the money paid each week for workmanship; but is the basis of every other account, and serves as an almost infallible remembrancer; for each team, and each laborer, passing under the eye, every evening, their works of the day must necessarily occur. If a field has been finished plowing, or sowing, if wheat has been carried into stack,—winnowed,—or sent to market, &c. &c. a mark, or *tick*, is made over it; that, at leisure, it may be carried to its proper head, in the check: when it receives an additional mark, or double tick.* †

The CHECK is divided into a journal part and a ledger part: the former admits the

* JAN: 1799. To every man, who is disposed to pay scientific attention to practical agriculture, a journal of this nature is indispensibly necessary. And, when a suitable book is prepared, filling in the column, of the day, can seldom require more than two minutes attention.

301. ACCOUNTS.

deliveries; the latter, the labor, produce, yield, &c. &c. &c. being both of them simplifiers of the journal and ledger; which are kept, nearly, in the ordinary method of book-keeping.

For the method of keeping the *labor* account of each division, see Min: 55.

The *field produce* is set down, under its specific head, as it is carried, mentioning the date—the division—the repository, and the number of field loads.

The *yield* and *disposal* are kept, on opposite pages; that the quantity of grain, &c. on hand, may be readily ascertained.

Although it may be difficult, for a farmer, to ascertain the neat profit of a crop, with that precision, which a merchant ascertains the neat proceeds of an account sales; yet the agricultor may come near enough the truth, to direct him in the choice of his
FUTURE PLAN OF MANAGEMENT.

INTRODUCTION

TO THE

EXPERIMENTS.

IF we compare human knowledge, with Omniscience, the former is narrowly circumscribed. Theory, hypothesis, and opinion, it is true, abound ; but the certain knowledge, clearly comprehend, even by the most enlightened understanding, might be compressed within a narrow compass.

It must be acknowledged, however, (and it ought to be acknowledged with singular gratitude, by the present inhabitants of civilized nations) that it is matter of astonishment, how a being, so limited, and so transient, as man is, can make the advances, which, at various periods, he has done, towards UNIVERSAL SCIENCE. The degree of elevation, which astronomy, geography, natural history, chemistry, the mathematics, mechanics, architecture, navi-

gation, the fine arts, and literature, now enjoy, would, in a less enlightened age, have been considered, as a height unattainable, by the human understanding.

But amid all the revolutions of human arts and sciences, is it not worthy of remark, that AGRICULTURE should never have been treated as a SCIENCE ? that it should never have been professedly considered, as a branch of EXPERIMENTAL PHILOSOPHY ?

The UTILITY of EXPERIMENTS in AGRICULTURE, must be obvious to every one ; for although a fortuitous INCIDENT may be equally instructive, as the looked for result of an EXPERIMENT ; yet the former, being merely accidental, may be few ; while the latter can be encreased, at the will of the experimentalist. Experimenting, therefore, must be peculiarly useful to the NOVITIAL AGRICULTURIST ; and, to every man, even the most skilful in the profession, at his entrance into a NEW FARM.

The METHOD of MAKING EXPERIMENTS requires little explanation. It may be proper to observe, however, that circumspection, and accuracy, are indispensibly necessary to the operation ; the former, to guard against

any dissimilarity of soil, seed, &c. with which the experiment is about to be made ; and the latter, to mark minutely the SITE of EXPERIMENT.

When this lies in the field, labelled stakes are convenient : but they should not be implicitly relied on ; being liable to be removed, either by accident, or intention ; the place, therefore, should be identified, likewise, by the number of lands, distances in rods, &c.

In short, to give due authenticity to an experiment, an *identity* of PLACE, TIME, ELEMENT, and PROCESS, must be strictly observed, in every particular ; excepting, only, the *intended difference*, which constitutes the experiment. Nor can the experiment be *authentic*, if the process be, in any material instance, left to a second person : it must be performed, by the immediate hand, or under the immediate eye, of the experimentalist.

The MODE of REGISTERING EXPERIMENTS is of some importance. The accuracy of making is lost, if the experiment be not fully and accurately registered. The method, which the Writer adopted, two years ago, and which he has not yet found any reason

to alter, may be seen in the following register. The PROCESSES he registers progressively, as they are made ; leaving blank spaces, on the opposite side of the same page, to receive the respective RESULTS. And, in order to render each experiment still more perspicuous, he numbers it ; refers to the field, &c. in which it is made ; gives it a title ; and briefly minutes his INTENTION for making it.

This he does, by way of interrogation ; in order that he may have an opportunity of giving a brief answer ; comprehending the *amount* of the result. The process and result would seem barren, and abstruse, and be less interesting, were they not amplified, and elucidated, by the intention.

At first sight, perhaps, there will appear an impropriety, in the arrangement of the columns of the register. This arrangement was adopted, for the sake of uniformity ; the intention, or middle column, being considered as the body of the page ; the other two columns, as explanatory margins.

Beside, the process is frequently made, before any intention, with respect to an *experiment*, is formed : and, indeed, every prac-

tical man will find this to be the *cheapest* mode of experimenting. If he make out a list of experiments to be made, and, *without waiting for favorable opportunities*, set about making them, he will probably find the task, in some degree, arduous: his men will, frequently, be as awkward and displeased, as he will be embarrassed and out of humour. But if, when his carter has committed a mistake, or has been guilty of a partial neglect, &c. he make a virtue of necessity, and, instead of reprobating the untowardness of the circumstance, register it as a comparative experiment, it may become doubly useful.

In this incidental way, many of the following experiments were made: as, 307, when the *season* would not permit (*a*) to be sown with beans; where *accident* formed a road; and a shrubby bank *happened* to be grubbed: 314, where the manure *fell short* of covering the whole field: 336, where (*a*) was cross-harrowed, by a *mistake* of the plowman, &c. &c.

The most expressive way of registering the identity of the PLACE, of field experi-

ments, is, in general, to draw a rough *diagram of the field*; and identify the place of experiment, by the number of lands, &c. Examples of this mode of register are given, in experiments 307, and 308. A principal part of the following experiments were registered, in this diagrammatic manner: others were registered, in words, only, as 303, 306, 310, 313, &c. which stand, as in the autograph; others are described by gates, trees, hedges, &c. But as these details would be uninteresting to the reader, and as a simple letter is more perspicuous, the diagrams and verbal descriptions are suppressed, in the publication; excepting the above-mentioned; which are published as hints to those persons, whom interest, public spirit, or turn of mind, may engage, in EXPERIMENTAL AGRICULTURE.

OBSERVING the RESULTS of EXPERIMENTS is a *serious* employment; yet, if the experiments are not too numerous, it is, to an inquisitive mind, a very pleasing one: it is receiving, in the hand writing of Nature, answers to petitions, offered up at her throne.

The result may sometimes be *decisive*, without being, to superficial inspection, *obvious*. As for instance, in an experiment, on the change of seed wheat, the quantity of straw, and the length of the ears, may be the same ; but, on more minute inspection, the grain, from one species of seed, may be large, bright, and plump ; while that, from the other, may be small, dull, and shrivelled. Indeed, in an experiment of this kind, nothing but separating the grain, from equal portions, and weighing their products, can be nicely determinate. This is an operation, however, which steals away more attendance and attention, both of master and servant, than can, in common prudence, be spared, from the ordinary business of harvest. Even measuring out the ground, attending the cutting, and weighing the produce, in the field, is more inimical to the necessary bustle of the day, than any one, who has not experienced it, can be aware of. Beside, a result which does not, to close and repeated inspections, offer a perceptible difference, *to a judge*, is seldom sufficiently decisive.

GENERALLY, there is nothing more dangerous, in experimental agriculture, than making *too many* experiments ; especially, by a man who has the immediate superintendence of an extensive farm ; as both his farm, and his experiments, are thereby in danger of being neglected. A few subjects, well chosen, carefully made, fully registered, and duly attended to, are far more valuable than a larger number, in any degree neglected.

WITH respect to the following experiments, they are published, as an overture to experimental agriculture, rather than as a course of experiments, in themselves sufficiently important to become the objects of publication. As experiments in agriculture, however, it is hoped, they will not be thought wholly unimportant ; and the Author of them thinks it proper to declare, that, to the best of his knowledge, they are strictly authentic.

JANUARY, 1799. It is almost needless to observe, that the plan of experimental agriculture, here delineated, is adapted to the

use of PRACTICAL MEN, and may well be considered as an essential part of their practice. It belongs to a

PUBLIC INSTITUTION,

to enter into minute investigations, and prosecute the more difficult branches of the science.

EXPERIMENTS, IN THE SOUTHERN COUNTIES.*

The Process.	The Intention.	The Result.
April '76. Harrowed the whole field, with a pair of very light harrows, in order to raise fresh mold for the seed to drop upon; except a belt across the middle.	302. In I. 2. SOWING CLOVER. Is harrowing the soil, before sowing clover, over wheat, beneficial to the crop?	July, '77. The whole field was <i>equally</i> good. N. B. This belt was neither harrowed before, nor rolled after sowing: H. I. the same, and very good.
	Not by <i>this experiment.</i>	

* Published, in 1779, in EXPERIMENTS and OBSERVATIONS concerning AGRICULTURE and the WEATHER.

SOUTHERN COUNTIES.

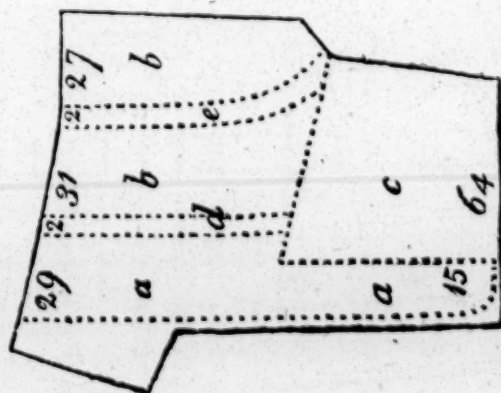
95

Sept. '76.	303.	Aug. '77.
Two lands against the road, from the winding part upwards, dry; the rest pickled in lime-water brine.	In P. 1. SOWING WHEAT. Is brining the seed advantageous to the crop? <i>Not by this experiment.</i> See the result.	It is remarkable that these two lands are forwarder, and a better crop than the rest of the field; and as totally free from smut.
Oct. '76.	304.	Aug. '77.
<i>a, a</i> , sown with seed raised on a sharp gravel (an opposite soil). <i>b</i> , with the very same species, raised on a clayey loam (a similar soil).	In L. 1. SEED WHEAT. Is changing the seed, from soil to soil of different species, beneficial to the crop? <i>In this instance, the reverse.</i>	Remarkable! <i>b</i> , was always the rankest crop; and is now more lodged than <i>a</i> , and several days forwarder.

The Process.	The Intention.	The Result.
1776. ————— (a,) a summer fallow of six plowings (including the breaking-up). (b,) mazagan beans in drills— horse - hoed, hand - hoed, hand-weeded, and, (with the spring-plowing) five times plowed.	305. ————— In L. 2. FALLOWING. Is a summer fallow, or a fallow crop, more advantageous to succeeding crops? <i>A summer fallow.*</i>	Aug. '77. ————— (a) much the rankest crop of wheat, with a gardenly stubble. Aug. '78. (a,) obviously the best crop of oats, and by much the cleanest stubble.
Oct. '76. ————— 17 lands over. 2 ——— under. 4 ——— over. 2 ——— under. 66 ——— over. The quantities of seed equal: about $2\frac{1}{2}$ bushels an acre.	306. ————— In L. 1. SOWING WHAET. Is under-plit, or over-plit, preferable, on a <i>strong tenacious</i> soil? <i>Over-plit</i>; with the same quantity of seed.	Aug. '77. ————— The under-plit the stronger straw, and the larger ears; but much the thinnest, much the foulest, and much the worst crop.

* Whenever a positive answer is given, "by this experiment" must always be understood. For it is not one result, but a series of similar results, which amount to certainty. One may be a strong evidence; but it generally

Whenever a positive answer is given, "by this experiment" must always be understood. For it is not one result, but a series of similar results, which amount to certainty. One may be a *strong evidence*, but it generally



a, a, tare-barley.
b, b, summer fallow.
c, beans.
*d, a beaten road.**
e, a grubbed bank.

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H

b, the rankest crop.
d, the strongest.
e, very good.
a and c, equally good; and
equally foul, compared with the
summer fallow.

N. B. The whole well dunged;
except (*e*).

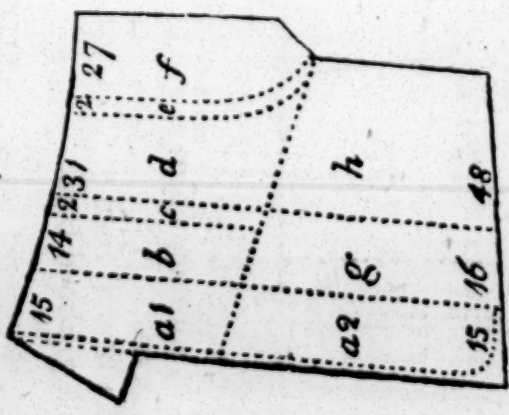
In L. I.
SUCCESSION.

What does wheat prefer, to suc-
ceed?

A summer fallow;
A beaten road;
Virgin earth;
Tare barley;
Beans.

* Made by the plow teams and dung carts.

EXPERIMENTS.

The Process.	The Intention.	The Result.
Oct. '76.  a, 1. (ta. bar.) had 7 a, 2. (ta. bar.) — 6 b, (ta. bar.) — 5 c, (road) — 5 d, (sum. fal.) — 6 e, (grub. b.) — 7 f, (sum. fal.) — 7 g, (beans) — 4 h, (beans) — 5 plowings, (including the breaking up).	308. In L. 1. TILLAGE. How does the quantity of tillage affect the succeeding crops and stubbles? <i>The crops good, and the stubbles clean, in proportion to the number of plowings; except that a summer fallow of six plowings was preferable to a fallow crop, with the same quantity of tillage.</i>	Aug. '77. (Wheat.) <i>d and f, the rankest crop, and cleanest stubble.</i> <i>c, the strongest, but foul.</i> <i>a 1 and b (crossed) much better than a 2 and g, (not crossed).</i> <i>g, weedier than b.</i> <i>b, weedy.</i> <i>e, a good crop, though undunged.</i> Aug. '78. (Oats.) <i>c, d, e, and f, much the best and cleanest crop; and the stubble beyond comparison, cleaner, than the parts fallow-cropped.</i>

Nov. '76.	309.	Aug. '77.
<i>a</i>, was plowed the 18 Sept. with a full bite of clover upon it. <i>b</i>, the 23 Oct. closely pastured. The whole fluted, and sown promiscuously, the 2 Nov.	In P. 3. FLUTING. Is it better to flute the fresh plit of a clover ley, plowed when closely pastured, or the stale plit plowed with clover upon it, for WHEAT on a <i>gravelly loam</i>? <i>The stale plit.</i>	<i>a</i>, is, very perceptibly, the strongest crop, and the cleanest stubble.
Nov. '76.	310.	Aug. '77.
H 2 There are several obvious experiments in P. 2.	In P. 2. DEPOSITING GRAVEL. Should a sharp gravelly loam be laid up, round, or should it be plowed flat? <i>It should be landed up.</i>	It is remarkable that the round lands, not only looked best, during winter; but are now obviously the best crop.

EXPERIMENTS.

The Process.	The Intention.	The Result.
Nov. '76. ——— <i>a</i>, one bushel and a half. <i>b</i>, four bushels. <i>c</i>, Two and a half bushels, an acre.	311. ——— In P. 2. SOWING WHEAT. Is thick, or thin, sowing preferable, on a gravel? <i>Thin</i>, if the summer prove <i>wet</i>.	Aug. '77. ——— <i>a</i>, much the best crop. <i>c</i>, about 50 shucks an acre. <i>b</i>, Very bad: scarcely worth reaping! The straw and the ears equally short and puny;—<i>this very wet year</i>.
Nov. '76. ——— <i>a, a, a</i>, raised on a gravelly loam (a similar soil). <i>b, b</i>, on a clayey loam (an opposite soil); the species exactly the same; being two years ago produced from one stock.	312. ——— In P. 2. SEED WHEAT. Is it advantageous to change it from soil to soil, of different species? <i>Not by this experiment.</i>	Aug. '77. ——— <i>a, a, a</i>, the forwardest, and the most lodged.—The straw weaker and more blighted than <i>b, b</i>. The crops, on the whole, were nearly equal.

Nov. '76.	313.	Jan. '77.
SOWING BARLEY.		
Sowed about half an acre, in Garden Field, the 7 Nov.	In S. 2.	The late severe weather has made the whole hang its head, and look wan : some of the tips quite nipped with the frost.
Fluted one side of each ridge, and left the other side in whole plits.	Will barley, sown in November, stand the winter ?	
Two lands, next to the wheat, sown dry. The four middle ones pickled in lime-water brine. The two hither ones, and the frustum, dry.	Yes.	Aug. '77.
The quantity of seed $2\frac{1}{2}$ bushels, an acre.	Should it be sown, in autumn, over flutes, or over the fresh plit ?	The whole a good crop : and the straw comes very timely for thatch.
	Over flutes.	The flutes, the evenest crop.
	Should the seed be brined, or should it be sown dry ?	The dry, equally as good as the prepared.
	Sown dry.	

SOUTHERN COUNTIES.

EXPERIMENTS.

The Process.	The Intention.	The Result.
— Nov. '76. — <i>a</i>, sixteen jags, an acre, of pond mud, cast out about 15 months ago; no mixture whatever. <i>b</i>, nothing.	314. In D. 2. MANURING. Are pond dregs, laid on in <i>November</i>, serviceable to a clayey meadow? <i>Not obviously.</i>	July '77. — The whole a good crop: no obvious difference, this year. July, '78. Nor this: the whole a good crop, and remarkably full of white clover, which I attributed to the mud, until I perceived the part not mudded is the same. How dangerous to <i>infer</i>, without <i>proof</i>.
— Dec. '76. — <i>a, a, a</i>, about 24 jags of weak compost (about 2-3ds mold and 1-3d dung) an acre. <i>b, b, b</i>, nothing.	315. In C. 1. MANURING. Of what use is compost, laid on in <i>December</i>, to young grasses on a clayey loam? <i>Of none.</i>	Aug. '77. — Astonishing! Not the trace of a difference: the whole being bad; though a hay year. Aug. '78. Exactly the same! The compost, wholly unserviceable!

— Jan. '77. —

316.

July, '77. —

SOUTHERN COUNTIES.

103

Jan. '77. <i>a, a, a</i>, sandy loam and dung: about 2-3ds dung: <i>b, b, b</i>, pond mud and dung: about 1-3d dung.	316. In I. 2. MANURE. Is pond-dreg compost, or sandy loam compost, preferable, to be laid on, in <i>January</i>, for clover and wheat, on a retentive loam? <i>See the result.</i>	July, '77. Equally unserviceable to the first crop of clover. Aug. '77. As likewise to the second. Aug. '78. The wheat of <i>b</i>, if of either, is the larger crop; but that of <i>a</i>, is forwarder.
Jan. '77. See last Experiment. The quantity, upwards of 20 jags, an acre. <i>c</i>, left wholly undressed.	317. In I. 2. MANURING. Is it proper to lay compost on the surface of a retentive loam, for clover, in <i>January</i>? <i>No: exceedingly improper.</i>	July, '77. The compost of no use to the first crop. Aug. '77. Nor to the second.

EXPERIMENTS.

The Process.	The Intention.	The Result.
Feb. '77. <i>a, a, mud and 1-3d dung. b, b, mold and 2-3ds dung. c, undressed.</i>	318. In I. 2. MANURE. Is mud or mold preferable to mix with dung? <i>See the result.</i>	June, '77. The crops of clover from <i>a, b,</i> and <i>c,</i> are equally good: neither of the composts therefore acted; consequently their comparative me- rits cannot be ascertained by the clover. Aug. '78. Nor by the wheat.
Feb. '77. See the last experiment. The quantity upwards of 20 loads an acre.	319. In I. 2. MANURING. Is it, or is it not, good manage- ment to dress young clover on a retentive loam, in <i>February</i> ? <i>It is very bad management.</i>	June, '77. <i>c,</i> full as good a crop, as either <i>a,</i> or <i>b,</i> and obviously less grassy. Aug. '77. The second crop, the very same. Aug. '78. The difference between 20 loads of compost and nothing, is scarcely discernible!

discernible!

It is very bad management.

SOUTHERN COUNTIES.

105

Feb. '77.	320.	June, '78.
The whole plashed rough, and the vacancies filled up with spray boughs; except one rod in length, which was pruned before plashing, and the vacancies supplied by naked rods. The whole afterwards pruned close, on both sides.	Between S. and H. PLASHING HEDGES. Is it better to prune the plashers and fill in with rods, or to leave the spray on, and fill in with spray bushes? <i>Prune the plashers, and fill in with rods.</i>	The part pruned and filled in with rods is much the best fence.

EXPERIMENTS.

The Process.	The Intention.	The result.
Feb. '77. — The whole field bush-harrowed, and the wheat stubble ox-raked into the inter-furrows, and carted off, for yard litter. <i>a</i>, was afterward heavy harrowed, and the weeds, &c. which the harrows eradicated, were ox-raked into the inter-furrows, and there buried. <i>b</i>, was harrowed, but not afterwards raked. <i>c</i>, only bush harrowed, and the stubble raked off.	321. — In M. 6. CLEARING STUBBLE GROUND What is the advantage of clearing the surface of light-land, before plowing for beans? <i>It is of no advantage to the immediate crop; but cleanses the soil for future crops.</i>	Feb. '77. — <i>a</i>, fluted the best. Aug. '77. The crops equal. <i>a</i>, obviously the cleanest stubble. <i>b</i> and <i>c</i> (equally) grassy, when compared with <i>a</i>.

* The stubble being tolerably clean, this left the surface almost as free as a fallow.

* The stubble being tolerably clean, this left the surface almost as free as a fallow.

SOUTHERN COUNTIES.

Mar. '77. <i>a</i>, whole. <i>b</i>, broken by one tine of the small round harrows, to prevent the seed from being buried. <i>c</i>, fluted.	322. In M. 1. SOWING TARE BARLEY. Is it better to sow tare barley on gravelly loam, over the fresh plit, whole; or over the fresh plit, broken; or over the fresh plit, fluted? <i>Fluted, if either.</i>	July, '77. The fluted the evenest crop. The harrowing before sowing had no apparent effect.
Mar. '77. <i>a</i>, broken, by once in a place, with the middle round harrows. The rest, whole.	323. In M. 1. SOWING TARE BARLEY. Is it better to sow it, on a strong loam, over the whole, or over the broken plit? <i>The whole plit, by this experiment.</i>	July, '77. No positive difference; if either, the whole is the best crop.

EXPERIMENTS.

The Process.	The Intention.	The Result.
Mar. '77. The tares of S. 5. a, Liquored—b, not. The clover of H. 1. a, Liquored—b, not. The clover of H. 2. a, Liquored—b, not. The liquor was of middling strength: it was very high colored and foul, but not puddly; and was carried on, in <i>wet weather</i>.	324. In S. 5. And H. 1. And H. 2. YARD LIQUOR. Are 20 pipes, an acre, obviously serviceable to tares, or clover, or sandy loam? No: at least, not in a wet March.	June, '77. The tares of S. 5.—Of no perceptible advantage. The clover of H. 1.—Of no advantage to the 1st crop. The clover of H. 2.—The service perceptible, but not obvious. Aug. '77. Of no service to the 2d crop of clover. Aug. '78. Nor to the succeeding crop of peas.

SOUTHERN COUNTIES.

109

29 April, '77.	325.	Aug. '77.
Mowed part of a ridge in the rankest part of the field, and gave the herbage to the oxen. The plants a foot high. The forage worth (at this time) three guineas, an acre.	In L. 1. TRAINING WHEAT. If wheat be very rank in the spring, is it eligible to check it, by cutting it for forage? Yes, perhaps, if the winter has been dry.*	The part mowed is less lodged; a few days later; much fouler; but, on the whole, a better crop, <i>this wet year</i> , than the parts not checked; beside the spring food.
April, '77.	326.	June, '78.
a, a, common red clover, raised on a chalky loam. b, b, cowgrass, bought of Gordon. Both sown the same day, by the same men; the quantities equal; the clover seed the best sample.	In B. 3 and 4. RED CLOVER. Is there any essential difference, between the <i>common</i> RED CLOVER and COWGRASS? Yes.	In B. 4. They are obviously distinct plants: the clover blows three weeks before the cowgrass; has more <i>pitb</i> and less <i>wood</i> ; is not so sweet to the taste, nor so large a crop, as the cowgrass. In B. 3. they both missed.

* This however must not be taken as a general guide; for although the winter of 76-77 was dry, and the ensuing summer proved wet; yet the winter of 77-78 was equally dry, and the drought continued, through the summer.

The Process.	The Intention.	The Result.
June '77. ————— Plowed in with a bury-surface plow, the tare barley and charlock of clays (the charlock beginning to pod), except two lands of No. 16. ($2\frac{1}{2}$ lands from the Male-bank) which were mown, for soiling, and plowed at the same time, with the other lands. The herbage, carried off, worth about 40s. an acre. July '77. ————— See last experiment. <i>a</i>, <i>a</i>, Cut for forage. <i>b</i>, Plowed in, with a bury-surface plow. <i>a</i>, Worth about 50s. an acre: <i>b</i>, about 40s.	327. ————— In M. 1. FOUL CROPS. Should tare barley, which is too full of ketlock to be suffered to stand, for hay, be cut and carried off, as green fodder, or should it be plowed in as manure? <i>See the result!</i> 328. ————— In M. 2. FOUL CROPS. Is it better management to ver- dage, or bury, a crop which is too foul to stand? <i>To cut it for forage, by these EXPERIMENTS. See OBS: 251.</i>	Aug. '78. ————— (Barley.) It is very remarkable, that the $2\frac{1}{2}$ lands (next the Male-bank) <i>buried</i>, and the two lands <i>carried off</i>, are perfectly equal: but what is still more extraordinary, the remainder of the same piece, <i>buried</i>, is obviously <i>worse</i> than the two lands (to which it joins) <i>carried off!</i> The parity of the one, and the disparity of the other, are evident to common observation. Aug. '78. —————
		(Barley.) Part of <i>a</i> is dubiously worse than <i>b</i>, but in other places, the part <i>carried off</i>, and the part <i>buried</i>, are equal.

July '77. ————— The clover of Barn Field was

329. ————— In the Home Stackyard.

June, '78. ————— The hay being put into stack.

SOUTHERN COUNTIES.

III

July 77. ————— The clover of Barn Field was out more than three weeks of rainy weather. Made it into two stacks, of equal size and quality; load for load. See MIN: 276. Salted one, with about a bushel ($\frac{1}{2}$ cwt.) of salt to a load of hay. The expence about 4s. a load. The other unsalted. ———— June and July '77. ————— The spring being uncommonly wet, the soil was reduced to a state of mortar. By way of experiment, however, I planted three beds while in that state. The rest were planted about a month afterwards, when the soil was become firm.	June, '78. ————— The hay being put into stack, quite dry, and the sap being exhausted by the weather, the salt did not assimilate with the hay, but remained several weeks (near the outsides at least) undissolved: and it is remarkable, that the stack which was salted did not take so kind a heat, nor settle so much, as that which was not salted.*
In the Home Stackyard. SALTING HAY. Is salt beneficial to cloverhay, which has been damaged in making? See the result. ———— 329. —————	May '78. ————— The three beds which were planted in mud were never worth cutting: many of them went off entirely, and the rest never throve. Those planted, a month afterwards, overtook them, before the last planted had been a month in the ground: yet these, being planted late in July, never came to their full size.
In S. 1. PLANTING CABBAGES. May cabbages be safely planted, when the soil is very wet? No: wait until the soil be in season; though the time of the year may be late.	

* The carters complained that the salt made their horses thirsty.

The Process.	The Intention.	The Result.
July, '77. — <i>a</i>, drumhead American. <i>b</i>, red Scotch. Part of each sort was transplanted, and part planted immediately from the seed bed.	331. — In S. 1. SPECIES OF CABBAGES. Are the American, or the red Scotch, fitter for a farmyard? <i>The American</i>, in winter. <i>The Scotch</i>, in spring.	May, '78. — The American much larger than the Scotch; but the Scotch stood longer in the spring.
31 July, '77. — Shook* the whole field into cocklets, while quite wet, except three swaths. Made part of the cocklets small (half bushels)—Part large (two bushels). The ground is now damp.	332. — In T. 4. HAYING. Should meadow herbage, which is nearly made, and turning yellow, be shook into cocklets, wet; or should it remain in swath? <i>Shook into cocklets</i>: especially when the ground is moist.	4. Aug. '77. — The cocklets are incomparably the best; the swaths are quite black. The small sized ones dried fastest; but the weather was tolerably fine: had much rain fallen, perhaps the large ones would have fared best.

* Rolling the swaths into hard lumps, is not the proper way of making them into cocklets: they should be shook, broken, and mixed, with a prong, leaving the cocklets as light as possible, with round smooth tops, and small *snags*.

1. Aug. '77.

Made the whole field into bushel

333.

In R. 3.

4. Aug. '77.

Although there

when the ground is moist.
 * Rolling the swaths into hard lumps, is not the proper way of making them into cocklets: they should be shook, broken, and mixed, with a prong, leaving the cocklets as light as possible, with round smooth tops, and small snags.

VOL. II.

1. Aug. '77.	333.	4. Aug. '77.
Made the whole field into bushel cocks, except a few swaths, which were part of them turned, and part left unmoved. The ground damp.	In R. 3. HAYING. Should meadow herbage which is spoiling, in swath, be cocked, or turned, or left untouched? <i>It should be cocked.</i>	Although there has not been much rain (gloomy, with showers; except yesterday, which was Sunday), the cocklets are the driest; the turned, next; the unmoved, very bad.
2. Sept. '77.	334.	3. Sept. '77.
This evening put G. 2. into small cocks. Left G. 1. in swath. There is an appearance of showers; but not of much rain.	In G. 1. and 2. HARVESTING OATS. If oats are fit for carrying, and the teams are otherwise employed, should the oats be put into small cocks? or should they be left in swath? <i>They should be left in swath.</i>	There was a heavy squall in the night; but the day has been very fine. The swaths of G. 1. were turned, about 11 o'clock, and were ready to carry, by 12. The cocks of G. 2. were lightened up with a fork (the rain did not go through them) about 10 o'clock; but were not fit to take up, until between 2 and 3.

I

The Process.	The Intention.	The Result.
— 6. Sept. '77. — A fine, hot, drying morning; but a very heavy dew. Broke a few rows of the second crop of clover, of Barn Field, into thick beds, before breakfast, when the grass was quite wet. While the laborers eat their breakfasts the dew went off, when the remainder were broken into similar beds.	— 335. — In I. 2. HAYING. If, in the morning, the wind get up, and the sun break out hot, should hay, which is in cocklets, be broken into beds, while the dew is on the grass? Or should it remain in cocklets (notwithstanding the fineness of the morning) until the dew go off? <i>See the Result.</i>	— 6. Sept. '77. — The surfaces of the first-broken were presently dry; but when we came to turn them, their bottoms were as wet as thatch. The last-broken were drier, in three hours, by one turning, than the others were, in five hours, by two turnings: for the grass being skreened from the sun and wind, it still retained its moisture, and still kept damping the under parts of the beds. <i>The dew heavy and the ground cool.</i>
— 10. May, '78. — <i>a</i>, was cross-harrowed (by mistake) before the cross-plowing. <i>b</i>, cross-plowed, with the ridglets entire. <i>a</i>, Broke up more fallow, than <i>b</i>, which came up in large cubical clods.	— 336. — In G. 2. FALLOWING. Should a foul stubble, which has been laid up in ridglets, in winter, be crossed, in May, with or without a previous harrowing? <i>Without a previous harrowing. And see MAY 24.</i>	— Oct. '78. — <i>b</i>, is perceptibly the best fallow. The harrowing, therefore, was not only thrown away, but was applied to an injurious purpose.

INTRODUCTION

TO THE

OBSERVATIONS.

EXPERIENCE is certain knowledge acquired by observation.

OBSERVATION is the action of the senses, upon objects, and of reason upon ideas.

IDEAS may present themselves, fortuitously, or they may be intentionally sought for:—if they present themselves, fortuitously, they may be said to come, by incident:—if they be sought for, intentionally, they come by experiment.

INCIDENTS and EXPERIMENTS, therefore, are the same; except that incidents furnish unlooked for information, experiments, that which was sought after; but whether the experience be incidental, or experimental, it is indiscriminately conveyed to the understanding, by observation.*

* For making an experiment conveys no experience to the mind, until its result be ascertained by observation; any more than does one of the numerous incidents, which happen every day, without being observed.

Observation, therefore, is the process, whereby the senses act upon objects, and reason operates upon ideas; whether the objects and ideas occur, by incident, or are developed by experiment. And it is allied to EXPERIENCE, as sculpture is to statues: observation is the process; experience, the production.

Observation may act, *voluntarily*, or *involuntarily*: thus, the PHILOSOPHER becomes wise, through *design*; the MECHANIC expert, through *habit*: but they are both of them led, by observation;—the one, advertently; the other, without being sensible of it.

Unintentional observation may, therefore, give *art*: but intentional observation, alone, can produce *science*.

ART, without science, is dependent on the memory, and rests solely with artists; SCIENCE perpetuates the art, and transfers it, to distant nations, and future ages.

TO APPLY this reasoning to AGRICULTURE;—the illiterate husbandman, either acts, wholly, by *custom*, or, if he observe, advertently, trusts his observation to his

memory. The scientific farmer, on the contrary, not only *observes*, and *records*, the useful information which occurs to him, in the course of his practice, by INCIDENT; but *discovers*, by EXPERIMENT, valuable facts, which never might have come, incidentally, within his knowledge.

Nor does he rest satisfied, here; for, barely to record useful observations is only one step, superior, to leaving them confusedly, in the memory: some METHOD is necessary: they must be *digested*,—*systemized*; or, should they become voluminous, they will remain, like the miscellaneous entries of an accountant's journal, an almost useless chaos of valuable information. They must, therefore, like the MINUTES of a MERCHANT, be reduced to the LEDGER FORM—to a SYSTEM.

SYSTEM, however, as defined by our best lexicographer, “*any complexure or combination of things, acting together*”——“*a (or any) scheme, which unites many things in order,*” does not convey the idea that is here intended, by A SYSTEM; which is not *any* complexure, nor *a* scheme; but a *certain* complexure, and *the* scheme, or plan,

WHEREBY THE ELEMENTS AND OPERATIONS OF AN ART ARE ARRANGED IN THEIR NATURAL ORDER. NATURE has only *one* plan; consequently, there can be only one SYSTEM, of one ART.

The plan and operations of Nature, however, are seldom obvious, to human perception: they require, first, to be deliberately scrutinized, by ANALYSIS, and, afterwards, strictly demonstrated, by EXPERIENCE: by which, alone, the ANALYTIC OUTLINES can be improved, to a NATURAL SYSTEM. For each item of experience requires to be classed, under some certain head or subdivision; and if such head or subdivision has been omitted, by theory, or is found, in practice, to be erroneously arranged, it is necessarily added, or transplaced; and, thus, on experience, is raised a SCIENTIFIC SYSTEM.

FROM these premises, it is evident, that there are two distinct methods, whereby the experience, which a man gains in his own practice, may be preserved. The one is by minuting down the incidents and experiments, miscellaneously, as they occur,—

the other, by entering them, systematically, under their respective heads, in a digest, or blank system, previously opened, for this purpose.

But, by either of these methods, it requires much leisure, or great exertion, to detail every interesting particular, that may present itself, in the daily course of practice. And it never occurred to the Writer, until he was forming the digest, or systematic table of reference to the Minutes of Agriculture,* that the work of record might not only be shortened, but be made more complete, by uniting the two methods; and that it might be rendered still more easy, though less accurate and full, by merely analysing, at the end of a season, or the close of the year, the incidents relative to each crop, or object of management; and, by their comparative results, to regulate the practice of the ensuing year.†

* Similar to that which will be found at the close of these volumes.

† Yet the utility of such a retrospect was sufficiently evident; in MIN: 231, and 272, to have suggested the general principle. But, in most cases, practical ideas are the least obvious to human perception.

This summary method, however, having too much dependence on the memory, to reap the full benefit of practice, it is well to render it some assistance. And, since July 1777, the time of closing the Minutes, the Writer's method has been this:

If an idea struck him, forcibly, especially if it was such a one as would not fall, obviously, within the annual observations, he retained it by a rough, concise memorandum.

As the crops, whether of hay or corn, were HARVESTED, he remarked, minutely, their several degrees of *quantity* and *quality*; and, in hours of leisure, reverted to the elements, and the operations which produced them.

First, he recognized the SOIL, or soils, they grew in: if various, he compared the crops, with the species which produced them, and drew his inferences, accordingly. He then proceeded to the MANURE, with which the soil had been fertilized; and the SEED, from which the crops had been raised; (as well as the WEATHER, by which they had been influenced.)

Having taken a view of the ELEMENTS, or things which were managed, he next

took a retrospect of the PROCESSES, or operations, made use of in their management. First, he recalled to his memory the general management, or SUCCESSION of one crop to another, which had taken place, for two or three years back : the SOIL PROCESS, or the tillage, which the soil had received : the SEED PROCESS, or the mode, &c. of sowing : the VEGETATING PROCESS, or the weedings, hoings, &c. which had been given : and, lastly, the VEGETABLE PROCESS, or the manner of harvesting, stacking, &c.

As he took this retrospect, of the various stages of his last year's management, he not only minuted such INFERENCES, as resulted, immediately, from the operation ; but mingled with them the INCIDENTS, which had been minuted, chronologically ; as also the EXPERIMENTS, which had been made, relative to the respective crops.

This last (namely, classing the experiments with the incidents and inferences) was a fortunate idea, which never occurred to him, until he was registering the annual observations. He had spent some time, in considering, how he should methodize the miscellaneous experiments, so as to render

them of ordinary use; not being *then* aware, that incidents and experiments are so nearly similar.

On the maturest deliberation, the Author is so fully satisfied, with this analytic method of gaining agricultural knowledge, he cannot forego acknowledging a wish, that it may be attentively practised by others.

JANUARY, 1799. By the same means, I have since collected the ESTABLISHED PRACTICES OF PROFESSIONAL MEN, in each agricultural department of the kingdom. It has been my general plan, to minute, in a miscellaneous way, as they occurred, the more material points of practice, which fell under my observation: and, before I left a Station, to open a BLANK DIGEST, OR SYSTEMATIC REGISTER, to receive the ordinary items,—as well as abstracts of the Minutes,—under their respective heads: thus bringing into distinct points of view, the whole of what I had already collected; and enabling me to make out a list of queries, respecting the particulars still wanted.

Likewise, in TRAVELLING, I invariably pursue a similar method. If I travel, at

leisure, through a line of country which is new to me, and travel in a carriage, alone, *I note every thing that strikes the attention, as worthy of notice* : and moreover take, at the end of the stage, or journey, a SYSTEMATIC RETROSPECT of the country I have passed through. This is readily done, by laying before me a tablet, containing the particulars (systematically arranged) which come within the view and knowledge of a traveller. By which means, I not only gain a more comprehensive and accurate knowledge, of the passage of country still alive in the memory, than I should without such assistance ; but recollect particulars, which the pencil had omitted to note.

If I travel, on horseback, which renders writing more difficult and irksome, I note nothing, but what requires minute detail, or is entitled to particular notice ; depending upon an attentive retrospect, for the rest.

If I travel, in company, without a suitable opportunity of using the pencil, yet have leisure, at the end of the journey, to use my TABLET OF RECOLLECTION, I find that I am thereby enabled to put down, with sufficient accuracy, many particulars which,

without the retrospect, would have passed away, unprofitably, and never have re-entered the mind.

In like manner, practitioners, in agriculture, should accommodate themselves to circumstances. A man, with a scientific bent of mind, and with leisure sufficient to give it scope, may use every means, which the two methods are capable of furnishing. One of less leisure may pursue the middle path: while the merest man of business, who has neither leisure, nor inclination, for much writing, may profit, in a summary way, by an ANNUAL RETROSPECT.

OBSERVATIONS,
IN THE
SOUTHERN COUNTIES.*

337.

ARRANGEMENT,

1777.

IN AUTUMN, prior to wheat seedtime, the Writer has made it a rule, to sketch out the plan of his next year's management; by delineating an INTENDED ARRANGEMENT: which, however, he has never considered, as fixed, and inviolable; but has, on the contrary, kept altering and improving it, as circumstances required, during the winter and spring months.

* Published, in 1779, in EXPERIMENTS and OBSERVATIONS concerning AGRICULTURE and the WEATHER.

337. ARRANGEMENT, 1777.

This proposed plan, of the general economy of the farm, for the ensuing year, he has always found of great service, in assisting him to proportion his work to his strength,—the number of acres, to be plowed, to the number of teams, he has had in employment: thus preventing hurry and its evil attendants, on the one hand, and a want of *seasonable* employment, on the other: of course, being enabled (under ordinary circumstances) to do every thing, in due season, and in a suitable manner: beside the advantage of gaining, at the outset, a more comprehensive and distinct view of every department, and branch of the business of the coming year, than he could possibly have, without such assistance: and thereby of rendering the superintendence more pleasurable; and the management, throughout, more accurate and profitable.

In May, or as soon as the arable crops are in the ground, and the grass lands shut up for hay, or stocked as pasture grounds, he again takes a survey of the whole farm; noting how the several fields and parcels

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43½ Ac

WI
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4½ Ac

0½, o
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5¼, —
—
13½ Ac

337. ARRANGEMENT, 1777.

are then actually occupied; and arranging them, agreeably to their respective occupants: thus ascertaining the REAL ARRANGEMENT; and bringing under the eye, a full and clear view of the practice of the current year.

The following is their arrangement, in 1777.

WHEAT.

Acres.

24, in L 1 and 2.

18½, — P 1, 2, and 3.

1, — S 2.

 43½ Acres.

OATS.

Acres.

8½, in B 3 and 4.

5½, — A 4 and 5.

10, — G 1 and 2.

 24¼ Acres.

WINTER TARES.

3, in O 1, and 3.

1½, — S 1.

 4½ Acres.

POTATOES.

1½, in S 3.

CLOVER LEY.

10, in H 1 and 2.

12, — I 1 and 2.

8, — N 5 and 6.

15¼, — O 1 and 2.

 45¼ Acres.

BARLEY.

0½, of S 2.

PEA-BEANS.

10½, of M 3, 4, 5, and 6.

TARE BARLEY.

8¼, in M 1, and 2.

5¼, — F 2.

 13½ Acres.

PASTURE.

5¼, in K 2.

11½, — K 3.

6⅞, — R 1, 5, and 6.

 22⅞ Acres.

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MIXGRASS LEY.

$11\frac{1}{2}$, in A 1, 2, and 3.
 $6\frac{1}{2}$, — B 1 and 2.
 $5\frac{1}{4}$, — C 1 and 2.
 $7\frac{3}{4}$, — D 5.
 $3\frac{1}{8}$, — M 4 and 6.
 $1\frac{7}{8}$, — N 5 and 7.
 $0\frac{3}{4}$, — P 2.
 $7\frac{3}{8}$, — T 2 and 3.

44 $\frac{1}{8}$ Acres.

MEADOW.

$3\frac{7}{8}$, — in D 2 and 3.
 $1\frac{7}{8}$, — K 1.
 1, — L 1.
 $0\frac{3}{4}$, — P 2.
 $2\frac{7}{8}$, — R 3 and 4.
 $5\frac{3}{8}$, — T 1 and 4.

15 $\frac{3}{4}$ Acres.

269 $\frac{1}{8}$ Acres in all, excluding hedge, ditch, &c.

21 $\frac{7}{8}$ — of hedge, ditch, roads, &c.

Total 291, including waste.

FALLOW.

$4\frac{1}{4}$, in F 1. for Barl. and
 Clover.
 $6\frac{3}{8}$, — K 4. for Oats and
 Clover.
 $1\frac{1}{2}$, — S 4. for Cabbage.
 $1\frac{1}{2}$, — S 5. for Turnips.

13 $\frac{5}{8}$ Acres.

GIVEN UP, OR LETT OFF,

$10\frac{1}{4}$, in E.
 14, — N 1, 2, 3, and 4.
 1, — R 2.
 4, — Stray Lands,

29 $\frac{1}{4}$ Acres.

Thus, every rod of the farm is arranged, under the head to which it immediately pertained, in the year 1777. By this mode of arrangement, every plot, and every corner, is brought into view ; no part, be it

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337. ARRANGEMENT, 1777.

ever so minute, can escape notice; no straggling acre of fallow can be left unstirred; no ley forgot to be rolled; nor corn omitted to be disweeded: the eye, at one glance, takes in the whole economy of that year's management.

JANUARY 1799. This plan I have, since, invariably followed, wherever I have practised. See the WEST OF ENGLAND, for a more particular statement of the PRELIMINARIES OF PRACTICE.

IN the FIRST EDITION of these observations, RETROSPECTS of the management, incident to the several crops, produced in 1777 and 1778, were given, in DETAIL; being, there, inserted, at large, from the original manuscripts.

But as a SPECIMEN will be sufficient, to explain the method, I am solicitous to recommend, to every man who has leisure and exertion enough to execute it, I now detail, only, the article WHEAT, 1777; and abstract, from the rest, whatever I think may convey information, or useful hints, to practitioners in general.

338.

W H E A T,
1777.

<i>The Lands.</i>	<i>Gross Produce.</i>	<i>Estimated Yield.</i>
L. 24 acres.	71 harvest loads.	75 quarters.
S. 1 ———	2 ———	3 ———
P. 18½ ———	33½ ———	45 ———
43½ acres.	106½ harv. loads.	123* quarters.

SOILS and SUBSTRATA.

L, clayey loam, with a retentive subsoil.

S, sandy loam, with a retentive subsoil.

* Low as this estimate may seem, it proved to be above the truth. Where the crop was large, and much lodged, I laid it at a quarter each harvest load; but, it did not yield quite so much: whereas, in a *yielding year*, a load of equal size, will afford from two quarters to twenty bushels of wheat. Such is the unfavorable effect of a cold, wet summer, on the wheat crop, in this island.

338. WHEAT, 1777.

P, gravelly loam, with an absorbent sub-soil.

The stiff land produced the best crop; but it was the best tilled, and the best manured: there was good wheat, on some of the lighter soils; especially on the sandy loam, which was in a high state of tillage, and in good heart. And, perhaps, wheat affects almost every *species* of soil.

MANURE.

L, was dunged, for this crop.

S, was very well dunged, for that of 1776.

P, was manured, in part, for this,—in part, for 1776.

SEED.

Part was sown with seed, raised on a *kindred* soil.

Part, raised on an *alien* soil.

By EXPERIMENT 304,—From clay to clay gave a ranker, and a forwarder, crop of wheat, than from gravel to clay.

By EXPERIMENT 312,—From gravel to gravel gave a forwarder crop of wheat, than from clay to gravel.

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But this has not been a favorable year, for making experiments: the circumstance of *forwardness*, however, was as obvious as it is remarkable.

Nevertheless, the CHANGING OF SEED is an important subject, which calls for repeated experiments.

WEATHER.

The last *autumn* was very fine.

The *winter* temperate, and remarkably dry.

The *spring* was moist: February-March, unusually mild: March-April, cold.

The former part of *summer* was uncommonly wet. The second week of July—tolerably fine; but the rains did not cease, until the first of August. After this, the weather was extraordinarily fine. During August and September, there was scarcely a drop of rain.

This year's crop, therefore, furnishes positive evidence, that a wet summer is greatly injurious to wheat. Even where the straw stood, the grain is shrivelled and light: where the straw was much lodged, the

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grain is exceedingly thin, and the ears almost empty.*

SUCCESSION.

Part was after summer fallow ;

Part after fallow crops ;

Part after clover ley ;

Part of the fallow crops was potatoes (S ;)
part tare barley (part of L 1.) ; part mazagan beans (the chief part of L 2. and part of L 1.)

The summer fallow gave the best crop, and the cleanest stubble. Potatoes the next. Part of the beans (sown early) follows next. Part of the beans and the tare barley (sown a month later) next succeeds, in point of crop ; but the stubbles, both after the beans and tare barley, are very foul, in comparison with those after summer fallow. The clover ley was a tolerable crop ; but the stubble is intolerably foul.

By EXPERIMENT 305,—Summer fallow gave a larger crop, and a cleaner stubble, than horse-hoed beans.

By EXPERIMENT 307,—A good crop of

* See the last Note.

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wheat may be had, after a summer fallow; or after a beaten road; or fresh earth; or beans; or tare barley.

See more relative to the SUCCESSION, proper for wheat, in the GENERAL OBSERVATIONS, at the close of this article.

TILLAGE.

Part wholeyear fallow.

Part midsummer fallow.

Part once plowed.

By EXPERIMENT 305,—A summer fallow of six plowings, gave a larger crop, and a cleaner stubble, than a fallow crop, with two hoings, a weeding, and five plowings.

By EXPERIMENT 308,—A beaten road across a fallow, with five plowings, gave a stronger crop, than a full summer fallow, of seven plowings.

Therefore, perhaps, rolling fallows, very hard, would be good management.

By the same EXPERIMENT,—One additional cross-plowing increased the crop, considerably.

By the SAME,—Four plowings, after beans twice hoed, and six plowings after tare

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barley, gave weedy stubbles,—compared with summer fallow.

By INCIDENT, in L,—through the whole division, the crops and the stubbles were nearly in proportion, to the TILLAGE bestowed.

The retentive soils were universally laid up, in fivebout beds, and thoroughly cross-furrowed. The absorbent soil was part of it laid up *round*, part plowed *flat*.

By EXPERIMENT 310,—the advantage of rounding up, even a gravel, for wheat, was peculiarly obvious.

REMARK. This experiment was founded on the following theory.

Gravel and other porous soils are said, in the provincial language of this country, to “swallow mendment;” and perhaps it is a fact, that vegetable food may, by heavy rains, be washed down below the ordinary field of pasturage.

A porous soil, laid flat, on an open base, becomes a strainer, or sieve; and superfluous rain water has no other way to escape, than by passing *through* this sieve, filled

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with porous soil ; among which the vegetable food is deposited : and it is at least probable, that the water, in its passage, becomes impregnated with, and carries away, (perhaps entirely beneath the sphere of ordinary vegetation) some of those particles (be they what they may) which, otherwise, would have assisted the crop.

If, therefore, the soil can be deposited, in such a manner, as to prevent its acting as a *strainer*, this evil tendency of a porous soil may be avoided. And if, by rendering the surface acclivous, the superfluous rain be caused to *run off*, instead of *passing through*, the plant-feeding mold, the evil is of course avoided.

Besides, perhaps, *gravel*, which lies flat, *binds* more closely, than that which is laid up, in narrow ridges ; which having free liberty of expansion, the soil is suffered to remain in a mellow, more genial state.

Whether or not this reasoning is just, the result was clearly in its favor ; for not only the crop, on the round ridges, was obviously better, but the soil of those broken up, ob-

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viously more mellow* than that of the wide flat beds.

The piece, on which the above-mentioned experiment was more particularly made, is a sharp gravelly loam, which had been summer-fallowed, and dunged, and with which the dung had been thoroughly incorporated.

By INCIDENT in L.—Three and a half large harvest loads of wheat can grow on land, laid up in halfrod ridges. And, perhaps, they are preferable to every other sort of beds, for WHEAT, on clay, or gravel.

JANUARY, 1799. It is the universal practice of the WEST OF ENGLAND, even as far eastward as Hampshire, to lay up lands in narrow ridges, *for wheat*, be the soil and subsoil ever so absorbent.

MANURING.

Part plowed in ;

Part laid on the surface.

* Mellow may not be an epithet, sufficiently scientific ; but, in this instance, it conveys the Writer's meaning, as an agriculturist, better than any other which occurred to him. It is equally familiar, to the farmer and the gardener : though difficult to define.

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By INCIDENTS in L. and P.—Dunging the rough plit, of one deep plowing, and afterwards harrowing and plowing in the dung, is very superior management.*

By INCIDENTS, in P. neither dung nor compost, spread on the *surface* of the seed plowing, before fluting a *retentive loam*, for wheat, was of any evident benefit.

During winter, and early spring, the crops, in two well noted instances, looked promising; but, at harvest, they were thin, the straw short and weak, and the ears small.

The manure being lodged near the surface, and the soil too tenacious to let it freely down, the crop was rendered what is here termed “winter-proud.”†

SEMINATION.

Time of sowing.—Began sowing, the 29th of September, and finished, the 7th of November.

One side of L 1. was sown, from three weeks to a month, before the other. The

* See a Minute of the 21st July, 1776. See also WEST OF ENGLAND, MINUTE 17.

† See Explanation of Terms.

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early sown part was much the largest, rankest crop ; but it was almost wholly lodged, and the grain very light in the ear : whereas, the late sown, in general, stood ; the ears were large and well filled ; and, although the crop, in the field, was not more than two thirds so bulky, as that of the early sown, I am of opinion, that, in the barn, the late sown will prove the best crop.

This equality, however, is merely a casualty of the weather. Had the summer proved moderately dry, the early sown would have been considerably the best crop ; its plants, in the spring, were far more numerous and healthy, than those of the late sown.

REMARK.—The time of sowing is one of those mysteries of agriculture, which, being in some degree dependant, on the seasons of the ensuing year, cannot be nicely regulated, by human foresight. There may, nevertheless, be one general rule for the time of sowing ; which, taken in a general sense, may, perhaps, be applicable to every crop, and to every country,—*Sow poor lands, early ; rich lands, late.*

For, if the summer prove wet, a field, which is out of heart, runs no risk of being injured, by rankness; and the field, which is full of manure, will be prevented from lodging.

If the summer prove dry, a field, which is poor, and which does not get its surface shaded, before the drought set in, is in danger of being stinted, or wholly burnt up; while a field (of wheat at least) which is in heart, will force its way, in defiance of the dryness of the weather.

Early and late, however, when applied to the time of sowing, convey distinct meanings, in different countries. And, indeed, not only every country, but every district, may have, with strict propriety, its peculiar time of sowing. However, as a general regulation of the above maxim, we may, perhaps, safely venture to say,—*Begin with the soil which is poor, and finish with that which is in heart.*

JANUARY, 1799. There are few general rules admissable in practical agriculture. And it is with diffidence I republish these remarks. I have only to say, that I have

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not observed any thing, in practice, which *contradicts* them.

Preparation of the seed.—Part of it was prepared, by steeping it in strong lime water, sufficiently salted, to bear an egg ; and afterwards limed.

Part was sown, without preparation.

By EXPERIMENT 303,—brining the seed seemed to be disadvantageous to the crop.

And by other two, made with equal accuracy, there was not the least advantage arose, this year, from brining wheat.

This is the second year, I have made experiments, on this subject, without being able to ascertain its use ; it having always happened, that the entire pieces, on which the experiments have been made, were wholly free from smut (the disease intended to be guarded against) ; and, consequently, no comparison could be made.

Mode of sowing.

Part was sown, under-plit.

Part, over the fresh plit, rough.

Part, over the fresh plit, fluted.

Part, over the stale plit, fluted.

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By EXPERIMENT 306,— $2\frac{1}{8}$ bushels of wheat, sown over-plit, gave a better crop, and a cleaner stubble, than the same quantity of seed, plowed under.

It must be observed, however, that this experiment was made in L 1. a *clayey loam*: and that on a *light sandy loam*, the result might have been different; perhaps the reverse. With respect to a stiff, cold soil, however, this is a very decisive experiment: the part sown under plit had not half the number of plants, as had the part sown over-plit: and, generally, perhaps,—on cold wet land, two bushels of wheat sown over the fresh plit, is equivalent to three bushels plowed in.

By EXPERIMENT 309,—it is better to flute the stale plit, plowed with clover upon it, than the fresh plit, pastured.

This experiment was repeated in two or three different places, and the results were uniform.

Quantity of seed. — Various: on a par, about $2\frac{1}{8}$ bushels, an acre; and the crop, in general, too rank: but the seed was princi-

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pally sown over the fresh plit, or fresh flutes ; and, perhaps ;—two bushels of wheat, sown over a *fresh surface*, is equal to two and a half bushels, sown on a *stale plit*.

A tenacious soil is here more particularly spoken of ; the surface of which, when newly plowed, abounds with cells and fissures, which readily receive the seed ; but which are shut, or filled up, by the first shower of rain, or even by the moldering of the soil ; and when once these seed cells are closed, and the surface has acquired a varnish, or glazen crust, it becomes difficult to cover the seed, effectually.

By EXPERIMENT 311,—Thin sowing of wheat, on a gravel, is fortunate, when the summer proves wet.

The $1\frac{1}{2}$ bushel (see the experiment) gave quite a rank crop ; the $2\frac{1}{2}$ bushels, a middling crop : while that from the four bushels, was not more than eighteen inches high ; many of the ears not an inch long, and the straws not thicker than the stems of ray-grass ! But, perhaps, had the spring and summer proved *dry*, the first would have been burnt up ; while the last might have

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been a good crop. It must also be observed, that this experiment was made over flutes, and probably almost every grain vegetated.

From this year's experience, and from repeated observations, in *dry* years, I am convinced, that the quantity of seed, for a burning gravel, cannot be nearly ascertained, without a fore-knowledge of the weather of the ensuing summer ; and this cannot be attained.

Therefore ;—burning gravels are hazardous soils, to a farmer.

Covering the seed.—The whole, whether fallow or ley, (except a part sown under-plut) was harrowed, as fine as a garden. No labor was spared, until the beds were rendered (by the concave harrows) perfectly convex, their surfaces fine, and the seed covered.

Adjusting the surface.—Part of the inter-furrows were opened, with the double plow ; part left cloddy ; and a comparative experiment was registered ; but the whole was so rank, and so much lodged, no accurate inference could be drawn. The wet soils were carefully cross-furrowed, sufficiently

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deep, to drain, effectually, the interfurrows,
and sufficiently wide, to walk in.

TRAINING.

The part, summer fallowed, being very rank, in the spring, I experimentally mowed one land, in the wane of April, to try the effect of checking the crop.

By EXPERIMENT 325;—mowing down rank wheat, in April, the summer proving wet, was beneficial to the crop.

Therefore, in future, perhaps,—if the winter prove dry,* pasture or mow down rank wheat, in April.

But it must be observed that, by the same experiment, mowing wheat, in April, fouled the soil.

Therefore, in future, perhaps,—if winter prove wet, let wheat, which is rank, take the chance of the summer. For beyond a doubt, checking the crop fouls the soil, lessens the quantity of straw, retards the ripening, and, in case of a dry summer, must injure the crop very considerably.

* But see a note to Experiment 325.

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Therefore, in future, perhaps,—whether the winter prove wet or dry, do not check wheat which is not very rank.

However, if wheat, in April, show an extraordinary inclination to rankness, it is obviously good management to check it; not only, as a preventive against lodging, but by way of gaining a valuable acquisition of SPRING FEEDAGE, whether FORAGE or PASTURAGE.*

HARVESTING.

Began to reap the 12th of August.

The crop, in general, was so very large, and so exceedingly lodged, I almost despaired of getting it cut. The major part of the 24 acres in L. was cut at twenty shillings an acre!

Had not this wheat ripened, nearly a week earlier, than the wheats in general of the

* JAN: 1799. The proper treatment of wheat, which has acquired too great rankness of growth in the spring, is a difficult part of its culture; and is a subject, on which professional men differ, in their opinions. I therefore suffer these reflections to stand; in order to assist in bringing on a more profitable discussion of the subject.

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neighborhood, it would not have been reaped, even at this price; and, perhaps, on a par of years, early ripe wheat may be reaped the cheapest.

The following precautions were given to each set of reapers;

“ Be careful not to make the sheaves too large :

“ Tie them securely, but not too tight :

“ Let the wreaths (or twists) of the bands be turned upward, toward the ears; that the tails (or butts) of the bands may hang down, to convey the rain water to the ground.

“ In setting up the sheaves, be careful to place the ears of the bands, inward; and do not crowd the sheaves too close to each other, in the shucks.”

THE CROP.

On the whole, very large: much too large; being, in general, much lodged. Off $43\frac{1}{2}$ acres we carried $106\frac{1}{2}$ middling field loads. Sixteen acres of the rankest part of L. produced $58\frac{1}{2}$ loads: upwards of $3\frac{1}{2}$

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loads, an acre! See the general Observations, below.

STUBBLES.

After the parts summer-fallowed, they are beautifully clean.

After the parts fallow-cropped, middling.

After the clover leys, very foul.

It must be remembered, however, that these clover leys were after barley, after wheat, &c. *with only a winter and spring fallow*; which, *notwithstanding the labor bestowed upon it*, was not equal to the task of cleansing the soil, sufficiently, for spring corn and clover.

GENERAL OBSERVATIONS.

What was the management of the sixteen acres, which this year produced at the rate of $3\frac{1}{2}$ field loads, an acre?

The soil, a clayey loam had part of it a whole summer fallow;—part, a bean stubble, with a Lammas fallow: the whole dunged, with about ten fifty-foot loads (about 500 cubical feet) of prime horse

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dung, an acre, spread over the rough plit of *one deep plowing** ; harrowed ;—rolled ;—gathered into halfrod ridges, *very shallow* ;—harrowed ;—rolled ;—the ridges reversed, *moderately deep* ;—sown over the fresh plit, in very high tilth, in September-October ;—harrowed, extremely fine ;—the interfurrows opened, and the crossfurrows made wide and deep.—Although it is very flat, wet land, not a spoonful of water stood on it, during the winter.

The profession of agriculture would indeed be disheartening, if a good crop of wheat could not be obtained, from such management, and such weather, as attended these sixteen acres. And, were autumns, in general, as favorable as the last was, I should almost give up the thought of wheat on a clover ley : but such another wheat seedtime may never happen.

Had the division L. been caught, in a wet autumn, one half of it, at least, could not have been crompt, with wheat, and the seed of the other half must have been put in, very badly. Fine as the weather happened,

* See Minute 223.

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the labor, attendance, and attention, bestowed on it, were without end; and the anxiety, for the weather, equal to that of haytime and harvest.*

What would have been the case, this year, had I nothing but fallows—even summer fallows—to depend on, for WHEAT? The weather, from the middle of May to the middle of July, was incessantly rainy; and the ample crops of this harvest have fully employed the teams, ever since. Part of K 4, a summer fallow, is now (10 September) as green as a ley! I have not an acre of fallow, sowable with wheat, without two or three more plowings. Had I nothing but fallows, I could not, be the weather ever so fine, put in fifty acres of wheat, tolerably, before Christmas.

Very fortunately, however, I have clover leys, most of them dunged, ready to be landed up, for wheat, as soon as rain comes, to moisten the surface: and my *fallows*,

* See MIN: 136 and 154, for disadvantages of fallowing retentive lands, for wheat,—the common practice of this country.

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being for SPRING CORN, have yet to receive the autumn, winter, and spring tillage.

The crop, next in goodness, was from a clayey loam, part of it a bean, part a tare barley stubble, each of which received a very good Midsummer, or a Lammas, fallow; and were managed, almost exactly, by the process abovementioned; excepting, that this part of the division L, was sown, in October-November,—that, in September-October.

The next, which followed in point of goodness, was raised from a clover ley, on a gravelly loam, dunged for clover; landed up, by two oxen and a whip-rein plow, soon after the second crop of clover was off;—lay three weeks in rough plit;—was then harrowed,—fluted,—(sown—) and harrowed, with one horse only: the whole expence of labor was not five shillings, an acre.

Last autumn, this struck me as a most eligible process: this harvest has convinced me, that theory was once right. During winter and spring, the crop was beautiful; and, had it not been lodged, by the heavy

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rains of last summer, it would have been a very good crop at harvest ; and, notwithstanding the wetness of the summer, and the proneness of the soil to seed weeds, this crop was almost wholly free from them ; for they had vegetated, abundantly, while the soil lay in rough plit, and the harrows, and the flute, totally eradicated them.

The stubble, it is true, is foul with root weeds ; but this must not be charged, to the disadvantage of the succession of clover, wheat, nor to the process of fluting the stale plit of a clover ley ; but to the slovenly, tho prevalent succession of wheat, barley, clover.

IN FUTURE,*

I will not depend, wholly, on broken ground, for wheat. On the contrary,

* These GENERAL INFERENCES are drawn, while the practice of the preceding year, is not only fresh in the mind, but is arranged, there, in a methodized form, so as to be fully and clearly comprehended ; and they are intended to be strictly abided by, until farther experience shall prove them to be erroneous.

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A sufficiency of clean clover ley, for wheat, shall be a principal object of my future management.*

To this end, if stiff land be foul, and much exhausted, I will summer fallow it, and dung one deep plowing, for spring corn and clover, as in the aforementioned instance, for wheat.

If August prove moist, I will endeavor to plow, early, and flute the stale surface.

If the soil remain dry, until September-October, I will sow on the fresh plit.

I will endeavor (under ordinary circumstances) to begin sowing, on the poorest, and finish, with the richest, soil.

JANUARY, 1799. It is said, above, that the RETROSPECTIVE VIEW of the circumstances of management, which took place, in producing the wheat crop of 1777, was intentionally rendered full and comprehensive, as a specimen, or form, of the method

* It must be observed, that these resolutions are formed in the neighborhood of London, where clover hay generally bears a price, equal to that of the best meadow hay.

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of drawing forth agricultural knowledge, ANALYTICALLY, from a man's own practice. And, in revising it, with the same intention, I have found little occasion to alter, or abridge it.

But let not the fulness, and length, of this particular article, deter the busy, or the listless, from profiting by the plan it is intended to convey. It seldom happens that so many interesting particulars occur, in the culture of any one crop: as will be seen, by the fewness of notable incidents which arose, in cultivating many other crops, in the same and the succeeding year.

I think I may safely suggest, that any man, who can prevail upon himself to *begin*, and who, in the outset, will note only what strikes him, forcibly, as points of practice, which he ought to pursue, or avoid, in future, will find it, not only a profitable, but a pleasureable employment.

To a young man, or to any man, on his first entry upon fresh ground, this method cannot fail to prove highly beneficial. In the course of a very few years, he must necessarily find himself possessed of a valuable

338. WHEAT, 1777.

collection of facts, and inferences, methodically arranged, and easily referred to, as guides to his future management: not the theoretic assertions, nor even the scientific inferences, of other men, practising on other soils; but maxims, drawn from his own practice, on the very soils which form the subject of his future management.

339.

CLOVER,

1777.

SOIL. I find, on comparison, that the crops are nearly in proportion, to the tilth, and heart, of the respective soils: the *strongest loam*, however, seems to have the preference.

MANURE. By EXPERIMENTS, 316, to 319;—compost, laid on the surface of a *strong loam*, IN WINTER, was of no service to clover. But,

339. CLOVER, 1777.

By incidents, in H and O ;—compost, laid on a *sandy loam* or a *gravelly loam*, IN WINTER, was very beneficial.

WEATHER. April-May being dry, and the rains setting in, suddenly, the clover was forced hastily up, in a few weeks, This made the plants run much to *stem*, with little *leaf*, and still less *head*, or flower. The quantity of the crop was great ; but its quality was coarse and weak : and generally, perhaps, clover requires *moisture*, rather than *wet*.

TILLAGE. By this year's experience, clover requires a mellow, friable tilth ; the crops being in proportion to the state of tillage.

SOWING. By EXPERIMENT 302 ;—clover may be sown, with success, over wheat, without harrowing or rolling.

HARVESTING. The principal part had from a fortnight to three weeks rain.

The swaths were broken into cocklets, as fast, after mowing, as fair weather would permit, and the bared surface raked,—wet or dry.

Every fair blast was embraced, to turn the cocks ; and, when the weather changed,

339. CLOVER, 1777.

no pains were spared, to put it rustlingly dry into stack.*

One stack was salted.

By EXPERIMENT 329 ;—salting clover hay, which had been damaged by the weather, was, *apparently*, detrimental to it.

IN FUTURE,

I will not venture clover, on land which is out of tilth, or much out of heart.

Not manure a retentive soil, in winter, for clover.

I will not suffer clover herbage to lie on the ground, in swaths; except the weather be exceedingly fine.

Nor carry it, until it be rustlingly dry:

* MOISTURE of the ATMOSPHERE. It is remarkable, that while the hay, in H, a low situation, was perfectly dry, that in O, a high situation, was quite damp: it *made* much faster, in a low, than in a high situation. At Woodmanston, a still higher spot, it was at least one day of fine weather, behind Adscomb, and two behind Croydon Common. How is this to be accounted for? A great quantity of rain has since fallen.

339. CLOVER, 1777.

I will rather risk its spoiling, in the field, than in the stack.

Some weedy rubbish, which (being reserved for the top of the stack) stood near two months of rainy weather, in the field, is still *bay*; though it stood a month in large (three-pitch) cocks, without moving. The skirts of the cocks had all the appearance of dung. But after it had been *thoroughly broken* and *thoroughly dried*, its appearance was totally changed; and its palatableness, at least, restored. I offered some of it to the horses of the team which carried it, and they ate it, greedily.

340.

M E A D O W,

1777.

MANURE. By EXPERIMENT 314;—pond dregs, laid on a clayey meadow, in November, were of no obvious service.

339. CLOVER, 1777.

WEATHER. The meadow hay, this year, is more in quantity, but of a much worse quality, than usual. A very wet summer is pernicious, even to meadows.

SUCCESSION. Part pastured, last year, (T). The rest mowed.

That which was pastured, last year, produced the largest quantity, and the best herbage.

RAISING THE CROP. The whole was swept and rolled; and disweeded of docks, when the surface was moist: the expence not a shilling, an acre: and the benefit to this, and to succeeding crops is obvious: and, generally, disweeding meadows is a valuable operation, performed at a small expence.

But it should be judiciously timed; namely, when the weeds are conspicuous; but before the grass get too high.

HARVESTING. The meadows, too, (see clover) were cut, while the weather was unsettled;—but the crop was full grown, harvest was at hand, and, from the quantity of rain which had lately fallen, I judged

340. MEADOW, 1777.

that the chance was in favor of fair weather: I was, however, in part mistaken; a remnant still remained, and the principal part of this hay had ten or twelve days rain.

The wet came, so incessantly, there was only one day, on which the grass could, with any propriety, have been got off the ground; and, unfortunately, that day happened to be the day of rest. This lovely hay day being lost, it lay in swath, till quite yellow, and, under the hedges, beginning to turn black. The first fair day, the swaths were broken, into small cocks. This helped it very much; and, had the cocks been turned, and shook up, next day, the benefit would have been still greater; but it was, again, the day of rest: and after being once hurt, for want of breaking out of swath, it was again injured, for want of being broken out of cock. The first day of industry, it was shook into beds, turned, and carried into stack, rustlingly dry.

By EXPERIMENT, 332;—meadow herbage, which is nearly made, should be broken into cocklets, though ever so wet.

340. MEADOW, 1777.

By EXPERIMENT, 333;—it is better to cock it, than either to turn it, or to leave it unmoved.

But this hay harvest has been *remarkably wet*; and these Experiments, repeated, when the air is dry, and the ground hot, might afford different results.

IN FUTURE,

I will endeavor to pasture and mow meadow grounds, alternately.

I will not manure a retentive meadow, in winter.

Embrace every favorable opportunity of disweeding meadows, before the grass get too high.

If the ground be cold, cock meadow herbage, immediately after the sithe, or as soon as actual rain will permit. But,

Let the ground be hot or cold, and the weather settled or unsettled, I will not carry, until it be thoroughly dry.

For although the swaths, during the rain, looked yellow and perishing, yet, when fine weather came, the hay resumed, in

341. MEADOW, 1777.

some degree, its greenness, and takes a very fine heat in the stack.*

341.

B A R L E Y, 1777.

SEMINATION.—By EXPERIMENT 313:—barley may be sown, in November, with safety.

For S 2. the plot on which it was sown, is the wettest spot on the farm.

Last year, it was fully proved that barley† will stand a *very* severe winter, in a dry situation, sown in September. (See Minute 173.) And, this year, it is equally evident, that it may be sown, so late as November, in a very wet situation.‡

* See GENERAL REMARK, 290 ; which this year's practice corroborates.

† The common longeared barley,—*hordeum distichon*.

‡ The *climature* appears, in the DESCRIPTION of the FARM.

341. BARLEY, 1777.

It is true, the severe weather of last January made it droop, and look pale,—many of the tips being nipped by the frost ;—but as soon as the weather became warm, it resumed its vigor, as if it had not been diseased : I apprehend, however, from the thinness of the crop, that some of the plants perished. And, perhaps, barley sown, in autumn, should be sown, somewhat thicker, than that sown, in spring.

It did not seem to branch so much, as spring-sown barley.

By EXPERIMENT 313 ; — barley, sown over flutes, gave an evenner crop, than that sown on the rough plit.

By the SAME ; — the part sown, with dry seed, was equally as good, as that sown, with seed, which had been brined.

THE GROWING CROP. This plot of autumn-sown barley was remarkably clean ; even from charlock (wild mustard) ; which, had it been sown in spring, would have vegetated abundantly.

Wheat, rye, &c. it is observable, are always much freer from this weed, (provided

341. BARLEY, 1777.

they are neither harrowed nor rolled in the spring) than spring crops are.

HARVESTING. It was mown the 4th, and carried the 8th of August ; and was thrashed out, immediately, for thatch for the meadow hay.

GENERAL OBSERVATIONS.

The crop was tolerably good : near two harvest loads, laid at four quarters, an acre. But the grain is not remarkably fine. This, however, is not owing to the time of sowing, but to the species of soil ; for, last year, an adjoining plot, sown in the spring, was not nearly so good a sample : and the straw is, this year, invaluable. Many stacks now stand naked, for want of thatch, and must remain uncovered, until new wheat be thrashed out. The straw, from this autumn-sown crop, is long, remarkably strong, and nearly as good as wheat straw, for thatching stacks with. And it certainly is convenient, to have a piece of autumn-sown barley, for thatch, for the meadow hay and corn stacks.

This year, it is true, the meadow hay was

341. BARLEY, 1777.

cut, late, or it could not have received the benefit of this straw ; but the barley was likewise cut late : had it been a forward harvest, it would have been ready, a fortnight or three weeks ago. Last year, it was cut the 21st of July ; and, in any year, it will come soon enough, to be thrashed before the meadow hay has done settling ; and the first cut of clover is the only crop it will not cover.

REMARK. The practice of sowing barley, in the spring, has probably arisen, from its conveniency, rather than from its necessity. It being found necessary to sow wheat, in autumn, it became convenient to defer the sowing of barley, until spring. The practice becoming universal, custom took it for granted that barley would not stand the winter.

342. TARE BARLEY, 1777.

342.

TARE BARLEY,
1777.

SUCCESSION.—F 2. was after tares, after wheat. (After tares, because a fallow crop was necessary to class this field with F 1. a summer fallow). M 1. after wheat, after peas.

After tares, the barley was very good, but the tares were thin and puny. After wheat, the tares were luxuriant and abundant ; though the seed was identically the same.

Therefore, tares after tares appears, by this incident, to be ineligible.

SEMINATION. Part sown over the whole plit.

Part over the broken plit.

Part over flutes.

By EXPERIMENTS, 322 and 323, it was not essentially different, whether the plits

342. TARE BARLEY, 1777.

were broken, or left whole, or fluted, for this crop.

HARVESTING.—Began to cut the 5th of August,* when the tares had just done blowing, and the barley was beginning to change its color. It was broken into cocklets, immediately after the sithe,—turned, and shook up ;—and carried, without rain.

CROP.—About a ton and a half an acre.

STUBBLES.—Sufficiently clean, to be got ready for wheat, if required ; and may, therefore, be brought to a gardenly state, before they will be wanted, for spring corn and clover, in April or May.

IN FUTURE.

So long as I work oxen, on land which will not bear the fold, I will feed them on tare-barley fodder.

If the soil be clean enough, to require only one plowing, sow in autumn. As the crop, in this case, will come somewhat ear-

* It must be observed, that the harvest of 1777, was at least a fortnight later, than ordinary. Tare barley, sown in March, may, in general, be cut for hay, in the middle of July.

342. TARE BARLEY, 1777.

lier, than the spring-sown, and will consequently give room, for a more beneficial fallow.

343.

O A T S,

1777.

SUCCESSION. By INCIDENTS in A. and B 4. Summer-fallowing foul, exhausted, clayey loam, for oats and clover, is most husbandly management.

The crop of oats, though these fields had been exhausted, by three or four crops, was large (for the quality of the land) and the grain fine. While the countenance of the soil, and the evenness and vigor of the young clover, show, in strong colors, the propriety of the practice. On the contrary,

By INCIDENT in B 3;—oats and clover, after wheat and one plowing, is most slovenly management.

The countenance of the soil (where its face can be seen) is pallid and spiritless;

343. OATS, 1777.

and the scattered plants of clover seem to hide themselves among the weeds, as if conscious of their worthlessness.

It is proper to mention, however, that this field was sown with oats and clover, in order to class it with the adjoining field.

IN FUTURE,

Let the whole course of my stiff land management tend towards cleansing the soil, effectually, for oats and clover.

Where the soil is foul, and has been much exhausted, endeavor to lay some dung, on one deep plowing of a summer fallow: or sow soot, with the clover seed, and dung for the wheat.

Thus a crop of oats will be secured, by the tillage;—plants of clover, by the soot; and a crop of wheat, by the dung: with a stubble sufficiently clean, and sufficiently in heart, to admit of a fallow crop, as a preparative to oats, clover, wheat, and a summer fallow.

Thus, every eight years, the soil will receive, alternately, a fallow and a fallow crop.

344.
ARRANGEMENT,
1778.

TARES.

1½ Acre in S 2.

RYE.

1½ Acre in S 4.

1½ ——— S 5.

3 Acres.

WHEAT.

6¼ Acres in I 2.

5½ ——— I 1.

11 ——— of O 1.

4 ——— in N 6.

4 ——— of N 5.

1½ ——— in S 3.

32½ Acres.

PEAS.

3 Acres of P 1, 2.

10 ——— in H.

4 ——— P. 3.

17 Acres.

OATS.

24 Acres in L.

6¾ ——— K 4.

30¾ Acres

BARLEY.

18¾ Acres in M.

9½ ——— in F.

1½ ——— in S 1.

29¾ Acres.

17
5¼
7¼
5¼
3⅞
1⅞
1½
7⅞
49½

3⅞
13⅞
1
0¼
4⅞
5⅞
28¾

SOUTHERN COUNTIES.

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344. ARRANGEMENT, 1778.

MIXGRASS.

17 Acres in A.
 $5\frac{3}{4}$ ——— C.
 $7\frac{3}{4}$ ——— D. 1.
 $5\frac{1}{4}$ ——— K. 2.
 $3\frac{1}{8}$ ——— of M 4, 6.
 $1\frac{7}{8}$ ——— N.
 $1\frac{1}{2}$ ——— P 1.
 $7\frac{3}{8}$ ——— T 2, 3.

49 $\frac{1}{2}$ Acres.

MEADOW.

$3\frac{7}{8}$ Acres in D 2, 3.
 $13\frac{3}{8}$ ——— K 1, 3.
1 ——— L 1.
 $0\frac{3}{4}$ ——— P 2.
 $4\frac{3}{8}$ ——— R 1, 3.
 $5\frac{3}{8}$ ——— T 1, 4.

28 $\frac{3}{4}$ Acres.

CLOVER.

$8\frac{1}{4}$ Acres in B 3, 4.
 $4\frac{1}{2}$ ——— in O 1, 2.
—————
13 $\frac{1}{4}$ Acres.

PASTURE.

$4\frac{5}{8}$ Acres in R.

FALLOW.

$6\frac{1}{2}$ Acres in B 1, 2.
10 ——— G.
 $10\frac{3}{4}$ ——— P 1.
—————
27 $\frac{1}{4}$ Acres.
32 ——— given up, &c.
 $21\frac{7}{8}$ ——— hedges, &c.
—————

291 Acres, including waste,
&c.

345.

C L O V E R,
1778.

SOIL. The crop from B, where the soil was summer-fallowed (see Clover, 1777), was very good ; and even in B 3, the few straggling plants, which got foot-hold, were remarkably strong and vigorous ; although neither of these fields have been dunged since 1774, and, perhaps, clover affects, peculiarly, a tenacious, clayey loam.

SEED.—Part common red clover. Part cowgrass.

By EXPERIMENT 326 ; — *cowgrass* and *red clover* are obviously different plants.

By INCIDENTS, in C, D, K ; *cowgrass* will stand four years : and, on a soil it affects, may, in some cases, be peculiarly profitable : especially, as it reaches its perfection, the first year ; and does not, like lucern and sainfoin, require three or four years, to bring it to maturity.

345. CLOVER, 1778.

The cowgrass giving no hope of a second crop, it was pastured (and gave an abundance of feedage); except an experimental stripe, in the middle of a field of red clover (B 4.), which being exceedingly clean, and a promising crop, I suffered to stand for seed. This gave the cowgrass a fair opportunity of showing itself. When the clover seed was ripe, the cowgrass was but coming out into head; and, to get it out of the way, before the clover seed was cut, it was mown, and made into hay, the middle of September; and produced at the rate of about a load, an acre. But the first crop was cut (on account of the clover), before it was ripe; and the middle of September is too late in the year, to make hay. Therefore, cowgrass cannot, with propriety, be cut more than once.

WEATHER. — *Autumn* was remarkably dry.

Winter, upon the whole, dry, but not much frost. December-January was, for near a month, uncommonly gloomy, raw, uncomfortable weather; with some showers of snow, sleet, and rain.

345. CLOVER, 1778.

Spring, seasonable ; but inclinable to dry ; with some fine summer rains, in May.

Summer favorable. Haytime remarkably fine ;—between which and harvest we had a fine rain. Harvest free from rain.

Clover in general, this year, was not *tall*, but very full of *leaf* and *head* : last year it was all *stem*. Last year, May-June was remarkably wet ; this year, inclinable to dry, with some showers : and clover evidently affects *moisture*, rather than *wet*.

HARVESTING. Mown the latter end of June, when the *clover* was *in full head* : but the experimental slips of *cowgrass* being a fortnight or three weeks backwarder, they were barely *in bud*. The whole was wadded, —turned, —had some showers ; but was carried in good order.

CROPS. After summer fallow, near two loads an acre.

After one plowing, not half a load, an acre.

STUBBLES. After summer fallow, perfectly clean, and as fit to be sown with wheat, as a summer fallow can possibly be.

345. CLOVER, 1778.

After one plowing, as foul as weeds can make it, and fit for nothing, but a summer fallow.

IN FUTURE,

I will not venture clovers on any thing, but *clean fallow*.

If pasturage be wanted, sow cowgrass ;
if hay, red clover.

346.

LEY HERBAGE.

1778.

TILLAGE. After one plowing, the young leys are universally foul : after fallow, uniformly clean and promising ; excepting the upper part of T 3.

This favorite field (See MINUTE 67.) no longer retains its former appearance. The extreme wetness of the summer 1777, the largeness of the crop, and the lateness of cutting it, damaged the roots ; and the

346. LEY HERBAGE, 1778.

field being mown again, this year, the puny shoots could not struggle with the root weeds; which, now, almost wholly occupy the surface. And, nothing, except pasturing, three or four years, successively, can save this part from the plow and harrow.

From the miscarriage of this once promising ley, some useful lessons may be drawn.

IN FUTURE,

If, through a continuance of wet weather, or a hurry of business, a fallow, which is foul with root weeds, cannot be cleansed, in one season, let it lie fallow, another and another, rather than ley it, before it be perfectly cured.

Have no dependance whatever on a spring fallow, for cleaning foul land, from root weeds, sufficiently for leying.*

I will not mow a new ley, two years together; except it be remarkably clean, in extraordinary heart, and fully stocked

* JAN: 1799. Especially a sandy loam, lying on a retentive base. See DISTRICT OF MAIDSTONE, ART. TILLAGE.

346. LEY HERBAGE, 1778.

with plants : nor, in any case, let the herbage stand, until it be fully ripe.

JANUARY, 1799. If a young ley be ultimately intended for a MOWING GROUND, it should be kept closely pastured, during the first three years ; and, afterward, be mown with caution ; until the sward be firmly established.

347.

MEADOWS,

1778.

SUCCESSION. K 3, which had borne *hay*, for ten, perhaps twenty, years successively, was last year *pastured*, in order to improve its herbage ; and the effect fully answered the expectation ; the hay of this field, which had usually been harsh and “ benty,” being this year remarkably full of “ leaf grasses :” and generally, perhaps ;—to produce hard, benty hay, frequently mow ; to grow soft, herby hay, frequently pasture.

347. MEADOWS, 1778.

The theory of this principle of management is, at least, probable : for, if the taller grasses are suffered to stand, for a crop, they gain strength, predominate, and shed their seed ; while the tender herbs are checked, if not wholly smothered, by the close shade and dripping of their spreading panicles. But, by pasturing, they become stunted in their growth ; while the more dwarfish plants have an opportunity of gathering strength, spreading, and, if not eaten too bare, some of them of seeding.

HARVESTING. The weather being uncommonly fine, with every appearance of its being settled, I bestowed a particular attention on the making of this hay.

The swaths were broken, presently after the sithe, into thick beds ; which were afterwards turned ; and, in the evening, generally made into cocks, of a size proportionably to the degrees of grassiness of the herbage.

Next day, these cocks were broken out again, into beds ; carefully turned ; and carried to the stack, almost as green, as the grass was, before it was mown.

347. MEADOWS, 1778.

These several operations were intended to mix and assimilate the hay, without exposing it, too much, to the intense heat of the sun. No unbroken tuft, nor green lock, could escape the different breakings and turnings ; each part had the benefit of the sun, without being exposed to it, too long ; consequently, every part became equally, deliberately, and thoroughly made.

The motive for cocking this hay was twofold : the first,—one day's sun was not sufficient to make it, and it was cocked, in the evening, to guard against a squall, in the night : the other motive was founded on the following theory.

Before the herbage of a meadow can be stored up, as winter fodder, it must have dissipated a principal part of its natural juices. If grass be *thinly* exposed, to the sun and air, these juices are, of course, absorbed by the atmosphere ; and, if exposed too long, its nutritive quality may be considerably injured. On the contrary, if the herbage be kept in *thick* rows, or beds ; and more especially if it be incorporated, in a heap of any shape, or cock of any size ; is

347. MEADOWS, 1778.

it not rational to suppose, that the succulent grasses, which are in the very act of dissipating their superfluous sap, will communicate at least their flavor, if not some share of their nutritive quality, to the "bents,"* and drier parts? is it not at least rational, that many essential particles will be retained, which, had the hay been more thinly exposed, would have been communicated to the atmosphere?

JANUARY, 1799. There is nearly as much skill and caution required, to make hay, well, in a very dry parching season, as in rainy weather.

For another instance of practice, in such a season, see MIDLAND COUNTIES, MIN: 56.

* BENTS, a provincial term: the straw,—the stems,—the fruit stalks of blade grasses.

348. PEAS, 1778.

348.

P E A S,

1778.

SOIL. The WHITE PEAS of H. were sown the 12th of March, and came up remarkably well;—the plants were numerous, even, and healthy. But, during April and May, many of them *went off*, dwindling away, imperceptibly; insomuch, that a plot or two, which lie *wetter* and *colder* than the rest, were left entirely destitute of plants. About a quarter of an acre was sub-plowed,—harrowed,—the rubbish raked out,—and the land sown with turneps.

I had almost determined to have treated a principal part of the Ten Acres, in this manner: fortunately, however, I did not. For, when the subsoil became less chilling, and the surface had been moistened, by some *warm showers*, the surviving plants shot up, with uncommon rapidity; the

348. PEAS, 1778.

halm, on the thin parts, ran to six or eight feet long; and, even on the coldest parts, the crop was not bad.

On the whole, *as the weather happened*, the crop was moderately good. But I am firmly of opinion, that had the spring proved *cold*, and the summer *wet*, the crop, on the whole, would have scarcely been worth harvesting. And, perhaps, let the *soil* be ever so eligible, if the *subsoil* be retentive, it is at least hazardous to sow *white* peas.*

The GREY PEAS, of P 1, 2, were sown, very early (the 12th of February); but the weather setting in frosty and cold, they did not come up, until near the middle of March: from which time, *the subsoil being absorbent*, they never received the smallest check.

* Notwithstanding the seed peas, sown in H. were a beautiful sample, and boiled well, the produce is unsightly, and boil very ill: another reason for not sowing *boiling peas*, over a retentive or unsound subsoil. See DESCRIPTION OF THE FARM; also GENERAL REMARKS ON SHORES; for the nature of the substrata of this field.

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Those of P 3, (likewise grey) were sown the 14th of March. These received a check about the time, when those in H went off; but the roots of the plants remained untainted; and, as soon as they had received some warm showers, they rose, apace, and gave a good crop; notwithstanding the soil is much stiffer than what is generally esteemed a *pea soil*. And, perhaps generally, grey peas may be eligibly sown, on a strong loam, with a retentive subsoil.

WEATHER. From the beginning of harvest 1777, to the end of harvest 1778, we had not, generally speaking, any rain. The winter was remarkably free from wet, and so were spring and summer; excepting a few genial showers, before and after hay time.

It seems to be a generally received opinion, that peas, and other pulse, require moist weather. The crops of this year, however, prove that opinion to be erroneous, for such a *pea year* has not lately happened; the halm is not only luxuriant, but it is remarkably well podded. Therefore,—peas

348. PEAS, 1778.

seem to require warmth and moisture, rather than wet.

TILLAGE. The whole once plowed, with the bury-surface plow; excepting part of P 3, which did not require it.

In H, (a clover ley too foul for wheat on one plowing) the skim plow made very good work: the beds, after they had been harrowed, looked rather like garden than field beds; and the pea stubble appears much less couchy, than the clover ley was, before plowing. And we may safely infer, that burying the sward of a clover ley, for peas, is most eligible management.

HARVESTING. Principally cut, with "swaps"—short one-handed sithes.*

It is difficult to get laborers, by the acre, to take sufficient pains, in making them into proper bundles, reaps,† or wads: they mostly make them too large, and too flat

* See DISTRICT of MAIDSTONE, Sect: PEAS.

† In the North of England they are called reaps; and so are the unbound parcels of wheat, or other grain. And perhaps reaping, as applied in the South of England, where it means cutting, is a misapplication of this term.

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and ragged ; leaving them scattered, in the interfurrows, or wherever they happen to be made. Whereas a wad of peas should, in some measure, resemble a globe, or ball, of two feet, to two and a half feet, diameter, and be placed in rows, on the ridges of the lands, (supposing them to be halfrod lands) or, if the lands run, east and west, on the south side of the ridges. See MIN: 227.

This operation, however, is difficult and tedious to be done, with a sithe and the foot ; it is, therefore, more eligible to perform it, with a prong, or common hay fork: requiring of the mower, no more than to make the reaps of a proper size, without his attending, either to the forming, or the placing of them.

In dry weather, peas properly wadded, with a prong, are much sooner ready to carry, than those left in hard bundles, by the foot and sithe, without form or method ; and, in case of wet weather, they are not so liable to open, nor turn black ; their contact with the earth being small, and that, too, with the driest part of it.

Some workmen, it is true, will set them

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up very light and *hollow* with the foot. But these are rarely to be met with: nor will a *hollow* reap bear turning so well as a *porous* reap; and a man may be taught, in five minutes, to set them up high, with a prong. It is done by putting the tines into the middle of the wad, and, by a sudden shake, rendering the inner parts cellular, or porous, and forcing down the ragged outer skirts; which, by a circular motion of the hand, are formed into a kind of foot or pedestal, for the reaps to stand upon. The prong should be put in, and drawn out, perpendicularly, with the right hand placed close to the tines.

349.

W H E A T,

1778.

SOILS. S, a weak *sandy loam*, with a springy subsoil, produced $26\frac{1}{2}$,

349. WHEAT, 1778.

I 2, a stronger loam, with a retentive subsoil, $24\frac{1}{2}$,

O, the same, with the same, 23,

N, gravelly loam, with a varied subsoil, 22,

I 1, strong *sandy loam*, with a springy subsoil, $17\frac{1}{2}$, bushels, an acre.

Thus it appears, that *sandy loam* has given the best, and also the worst crop; and what renders the quality of the soil of still less importance, to wheat, the soil of S 3, is of an inferior quality, and is worse situated, than that of I 1. And it may be safely registered, that, in this year's practice,

The quantity of the crop of wheat had no *evident* dependance, on the specific quality of the soil.*

MANURE. There is no department of the rural science, which is less definite, than what relates to manure (See MIN: 152); even the quantity applied is difficult to define, a *load* is almost as vague a term, as a *heap*, or a *parcel*. Under the head MANURE,

* But see MANURE, also SUCCESSION, where a *strong loam*, lying on a *firm retentive base*, appears to advantage, as a WHEAT SOIL.

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in the GENERAL REMARKS 1779, this subject will be mentioned, more at large. Here, it is only necessary to say, that fifty cubical feet of digested dung are considered as a load, and ten such loads, or five hundred feet of dung, an acre, as an ordinary manuring.

S, 600 feet in long dung, plowed in for 1777.

I 2, 600 ——— compost, laid on for 1777.

O, 500 ——— short dung, plowed in for 1778.

N, 400 ——— various, plowed in for 1778.

I 1, 500 ——— compost, laid on for 1777.

Therefore,—this year's crop of wheat was nearly in proportion to the quantity of dung. Except that 600 feet, in long dung, *plowed in*, was preferable to 600 feet, in compost, *laid on*. Indeed,

By EXPERIMENT, 319;—the compost laid on I 2, a retentive soil, was of no obvious service to this crop.

WEATHER. The whole year has been remarkably free from rain: yet the ground was not droughty, until late in the summer;

349. WHEAT, 1778.

when it became as impenetrable as a pavement.

Perhaps, a year, so uniformly indulgent to the farmer, has seldom happened. The autumn was fine, to sow his wheat in.—The winter was temperate.—The spring dry, to get in his spring crops. Some fine rains fell between spring seedtime and haytime.—Haytime uncommonly fine.—Between this and harvest, a charming rain : and the harvest uniformly fair ! Nothing seemed to be wanted, which even a farmer could have wished for, excepting a few moderate showers, immediately before, and during harvest, to fill the grain, in the ear ; and perhaps, the backwardly sown wheats were some of them injured, by a thunder storm, which happened, just when they were blooming. But, taken all in all, another year, so favorable to the farmer, may not happen, for an age to come.

It is generally understood, that a dry year is good for wheat. This year, and its crops, corroborate that opinion. The burden is large, and the ears long. Yet wheat this year *yields* less, than was expected ; owing, probably, to the two unfavorable

349. WHEAT, 1778.

circumstances abovementioned : namely, the fecundation being interrupted, and the droughtiness of harvest.

SUCCESSION. S 3, after potatoes, after turneps.

I 2, after clover, after wheat, after wheat, &c.

O, after clover, after clover, after barley.

N, after clover, after barley, after tares, &c.

I 1, after clover, after barley, after wheat.

Potatoes, wheat, gave the best crop, on the worst land ; owing, probably, to the superior heart, and high tilth, of S 3. As well, perhaps, as to the effect of the potatoe crop.

Clover, wheat, was good or bad, nearly in proportion to the *state of cleanness* of the respective fields. And, generally, foul clover leys are unfit for wheat.

It is observable, that part of I 2 has borne three crops of wheat, in four years : and, what is still more worthy of notice, the two latter were much the best crops.

This plot was beans in rows, in 1774 : and, *the soil being tolerably clean*, the weeds were kept under, by repeated hoings.

349. WHEAT, 1778.

After the beans were drawn, the soil was subplowed, and landed up for wheat. The crop very indifferent. The adjoining part of the same field was likewise beans, in rows; *but the soil being foul*, the hoes were unable to subdue the weeds; and, instead of wheat, this part was summer fallow, in 1775. In order to bring the first mentioned part into the same crop, in 1776, the wheat was mowed, (See a Minute of 7 August, 1775), the ground plowed, three or four times,—had a sprinkling of dung,—and was landed up, with the rest of the field, for wheat. The crop very good. In the spring of 1776, clover seed was sown over the wheat; in the winter 1776-77, the whole of this part was manured, with compost, laid on the young seeds; and, in autumn 1777, the clover ley was broken up for the crop of wheat under consideration. The crop good.

Therefore, the succession appears to be less essential to wheat, than are manure and tillage. And see EXPERIMENT 319.

TILLAGE. S 3, plowed three times, with intermediate harrowings.

The clover leys, plowed once, with the skim plow.

Some of the leys, especially those of two years old, were very grassy; and had they been plowed, in a slovenly manner, the manes of the plits would, before harvest, have matted the surface; the crop would, of course, have been injured, and the stubbles left as green as leys; whereas, by burying the soddy edges of the plits, they are, now, less grassy, than the leys were, before plowing. The additional expence is trifling: it cannot be more than half a horse's work, or ninepence, an acre. And there can be no risk in asserting, that burying the sod of a clover ley, for wheat, is most eligible management.

It is true, that a good, or rather an excellent, plowman will plow *flat beds*, in such a manner, as to "tuck in" the sod without cutting it off; but the best plowman cannot lay up *round ridges*, in such a way, as will entirely answer the purpose of cutting off the soddy edge of the plit, and burying it, in the preceding plowfurrow.

349. WHEAT, 1778.

GENERAL OBSERVATION.

I have not, from this year's management, found any reason to alter the resolutions I formed, last year, with respect to the wheat process; and I can only add, this year,

IN FUTURE, I will not, be my plowman ever so excellent, plow a clover ley, for wheat, without burying the surface.

350.

O A T S,

1778.

SUCCESSION. K, after summer fallow, after wheat.

L, after wheat, after fallow or fallow crops.

The crops of both were large; but the summer fallow *yielded* much the best, and gave, beyond comparison, the finest *sample*.

350. OATS, 1778.

TILLAGE. K was plowed six times, with intermediate harrowings, &c. the wheat stubble, from which the fallow was made, being exceedingly foul.

L, was once plowed, with the skim plow; and left a stubble much superior to what could have been expected, from wheat, oats.

SEMINATION. Part of L was sufficiently harrowed. Part (through a want of self-attendance) badly; the plits being left, almost unbroken, and much of the seed consequently exposed, above ground.

The former produced a very good crop; the latter, a thin one,—almost smothered in weeds. The disparity, arising, wholly, from the difference of harrowing, was not less than two guineas an acre! and it may be said, that every shilling saved, in covering the seed, and pulverizing the surface, was a guinea lost in the crop.

The time of sowing was from the middle of March to the latter end of April.

K being in a very high state of tilth and condition, I was afraid the crop would be too rank: and, by lodging, would smother the young grasses; I therefore intention-

350. OATS, 1778.

ally deferred sowing this field, until the middle, or towards the wane, of April. I endeavored to regulate *the time of sowing*, and *the quantity of seed*, to *the state of the soil*; so as to have a full crop of oats, without injuring the ley herbage: and I was fortunate in my regulation; for,

By INCIDENT, in K;—four bushels of oats, sown in the wane of April, over a well dunged summer fallow, gave a *large*, yet a *standing* crop.

This incident serves to remove an objection to fallowing, and (if the soil be much out of heart) dunging, for spring corn and clover, or ley grasses; as, by hastening, or protracting, the time of sowing, and by increasing, or diminishing, the quantity of seed, a farmer may (the uncertainty of the weather apart) have almost any crop of spring corn he chooses. Consequently, the danger of rankness may, under ordinary circumstances, be avoided; especially of oats.

HARVESTING. Mown, while the knots, in general, were still green. Lay in swath, until the sap was wholly dissipated; and carried, with very little loss by shedding.

350. OATS, 1778.

THE CROP. On the whole, very good. Part of L 1, was exceedingly bulky ; but the grain is thin.

The *sample*, from the summer fallow, is at least ten percent superior to that, from the wheat stubble.

STUBBLE. K is perfectly clean ; except a part, which was caught in the wet of the summer of 1777, and which got so grassy, during the continuance of the rains, that it never was thoroughly cured.

L is much cleaner than could have been expected, after two corn crops, immediately following each other ; especially the part summer fallowed, for the wheat. The distinction, between this part, and the part fallow cropped, is obvious, at the distance of two miles !

351. BARLEY, 1778.

351.

B A R L E Y,

1778.

SUCCESSION.

Part, after summer fallow ;

Part after tare barley, mown off ;

Part after tare barley, plowed in.

By EXPERIMENTS 327, 328. It seems to be more eligible to mow off, than to bury, a foul crop.*

TILLAGE. The summer fallow was, in autumn, 1776, plowed in balks, laid up in

* JAN: 1799. These Experiments are interesting. That vegetable substances, incorporated with the soil, give an addition of fertility, is well ascertained. And there appears to be no other way of explaining the results of these experiments, than by admitting, that the exposure of the soil, in ridglets, during the heat of summer, is more beneficial to the crop of corn, *immediately* succeeding, than a crop of green herbage plowed under, with a plain flat surface.

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ridglets; part of which were experimentally cross plowed, in winter, part left entire, until after spring seedtime. The latter was much the best fallow. See MIN: 274.

The parts fallow cropped were balked, as soon as the crops were off; and having laid, some weeks, in this exposed state, they were cross plowed, before the hurry of wheat seedtime came on. After the wheat seed was in the ground, they were thoroughly harrowed; and presently afterwards, re-balked, or trenched, and cross-furrowed, for the winter.

This was the first time I had trenched a fallow: I had frequently laid a firm soil into ridglets, by turning an entire plit upon an unstirred balk; but had not raised loose mold into a similar state, by reaching about twenty inches, with a wide sterned plow; which not only leaves the mold in regular ridges, with a neatness beyond the art of the gardener to excel, but the whole soil is more or less stirred.

The beginning of April, the peas and the principal part of the oats being in, the winter ridglets were thrown down, by ano-

351. BARLEY, 1778.

ther cross-plowing ; — harrowed ; — compressed very hard, with the land plane ; — harrowed ; — and, (the remaining weeds having laid a few days to wither), gathered up into fivebout beds, for the seed.

The crop was uniformly large : but why it should be so, on land which had been exhausted, by three succeeding crops, cannot easily be accounted for ; except by its being exposed in ridglets ; first, to the scorching heat of dogdays, and, afterwards to the frosts of winter.

IN FUTURE,

Embrace every favorable opportunity of exposing foul lands to the atmosphere, in narrow ridglets, whether in the winter, or in the summer months.

JANUARY, 1799. Before I quit these ANNUAL RETROSPECTS, it may be right to remark, that they are not exclusively applicable, to the cultivation and management of CROPS, or vegetable productions, but are equally eligible, for gaining an accurate knowledge of the proper manage-

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ment of the different species and breeds of LIVESTOCK.

The BREEDER (of every species) the DAIRYMAN, or the GRAZIER, (whether of cattle or sheep), may, by examining, methodically, and closely, into the various branches and particulars of his past conduct, and committing his remarks to WRITING, year after year, and always in the same NATURAL ORDER, reach the higher grounds of his profession, sooner, and see his way, more clearly, than, in all human probability, he can, without such assistance.

SYSTEMATIZED ANALYSES of the usual departments of management, relative to the different species of LIVESTOCK, may be seen in the REGISTERS of PROVINCIAL PRACTICE; particularly, in those of YORKSHIRE, GLOUCESTERSHIRE, and the MIDLAND COUNTIES.

1779.

GENERAL REMARKS,

IN

THE SOUTHERN COUNTIES.*

352.

M A N U R E.

WHILE the nutriment of vegetables remains a mystery, the theory of melioration must, in a great measure, rest on hypothesis. Experience, it is true, may do much ; but, unassisted by some GENERAL PRINCIPLES, its advances, towards science, will be slow.

Indeed, so little understood is this department of agriculture, that even an ordinary communication of ideas, respecting it,

* Published, in 1779, in EXPERIMENTS and OBSERVATIONS, concerning AGRICULTURE and the WEATHER.

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is difficult. We may say that such a field was dunged, or had a dunging, in such a year ; but until it be ascertained, that dung is the food of vegetables, and how much of such food is meant by a dunging, the idea must be inadequate. It is true, a certain number of loads may be mentioned ; but, until the vegetable food contained in a load (that is to say its size) be ascertained, the idea will still remain vague.

The general subject will not, here, be attempted. That dung is a food of vegetables will be assumed, and this remark will be confined, to the QUANTITY of DUNG.*

In September, 1777, I had an opportunity of measuring a quantity of dung, which had lain, some time, in a deep regular pit, and which was thoroughly digested. After having moved away what lay above the

* This term is not made use of, either for its elegance, or because it conveys a precisely determinate idea ; but for its popularity, and because it conveys a more definite idea, than any other term in use. The idea, here meant to be communicated by it, is not animal excrements, only, but any solution of animal or vegetable substance, whether it be produced, in the animal viscera, or by fermentation, and putrefaction.

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surface of the pit, I levelled the top of that which remained, so as to reduce it to *stricken measure*; and kept a regular account of the loads, which were afterwards carried out of the pit; of which, when emptied, I took the exact gage.

The number of loads carried out were thirty.

The gage of the pit 2642 cubical feet.

Therefore the carts took away 88 cubical feet of dung, each load.

But the carts were extraordinarily large, one of them gaging 72, the other 85 cubical feet; on a medium $78\frac{1}{2}$ feet, which is 10 feet, each load, less than the number carried: the roof, on a par, therefore, contained 10 feet, beside the addition of bulk, caused by the porosity of the loads, compared with the compactness of the dung in the pit.

On gaging different carts, I found that one, of a middle size, did not contain 50 feet; I therefore fixed the medial size of a LOAD of dung, at 50 cubical feet; and 10 of such loads, or 500 cubical feet of perfectly resolved animal or vegetable sub-

352. MANURE.

stance, an acre, I consider as a medial DUNGING. See WHEAT, 1778.*

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THE WEATHER.

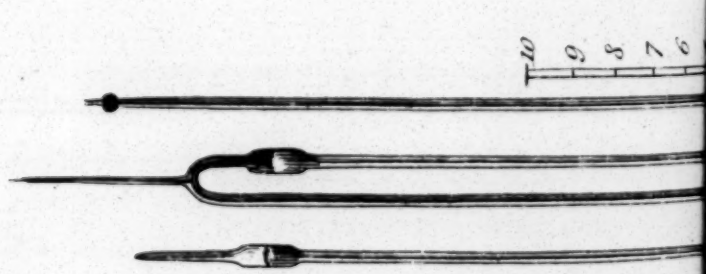
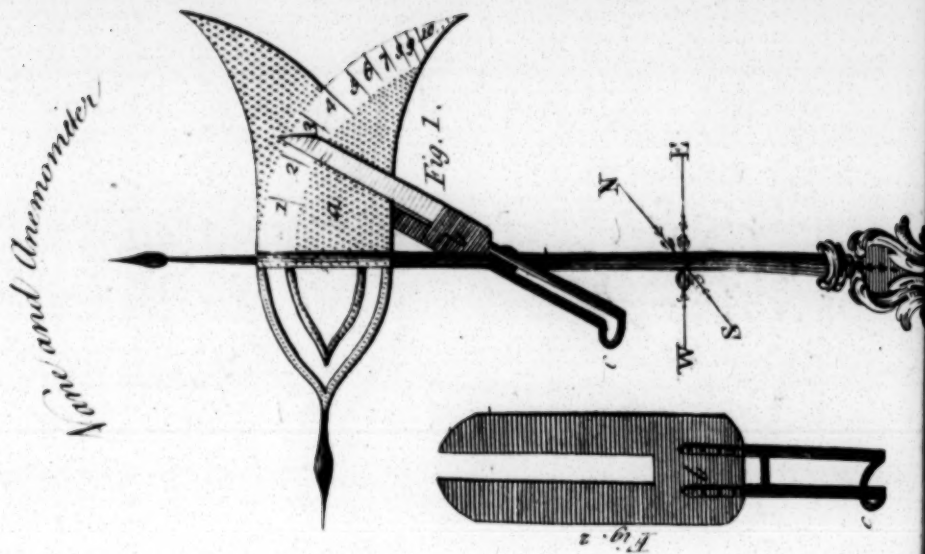
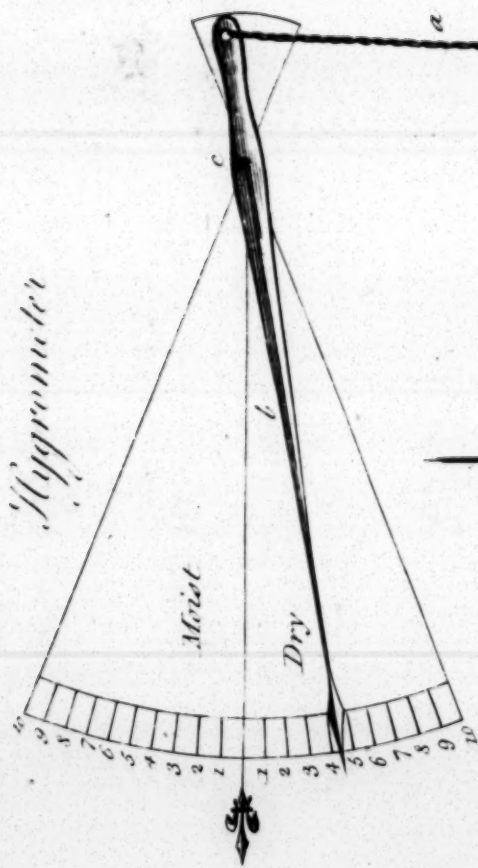
HAVING, during the course of the two last summers, recorded a variety of incidental observations, and registered a short course of experimental remarks, relating to this department of agricultural knowledge, I make use of this early occasion, to communicate them to the public.

And, that I may be more fully understood, I will previously describe the annexed

PLATE of INSTRUMENTS,
relating to the WEATHER. See PLATE V.

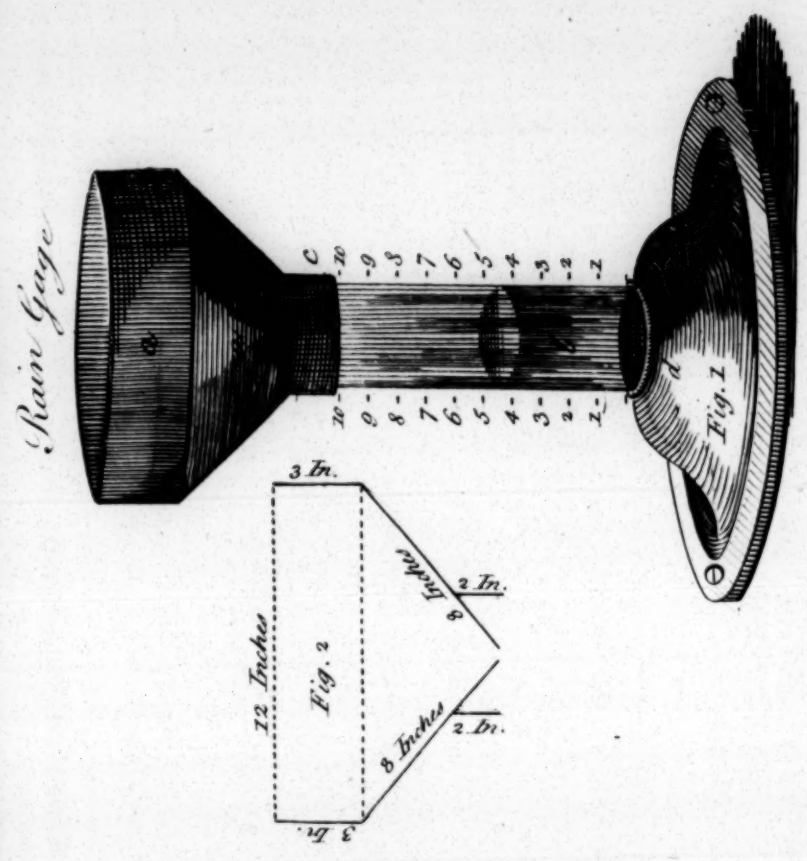
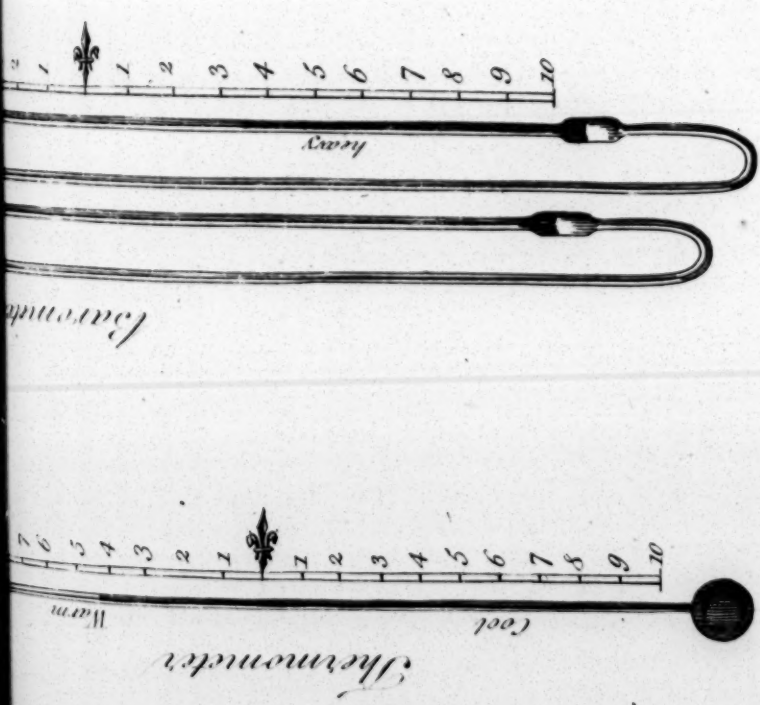
* Or the QUANTITY OF DUNG might be communicated, by the *thickness of the covering*. Five hundred cubical feet of matter will cover an acre of soil, nearly one seventh of an inch thick; 363 feet, exactly one tenth of an inch in thickness. But this would be less familiar to professional men, than the method referred to, above.

PLATE.V.



Rain Gauge

Barometer



Published May 1799, by G. G. & J. Robinson, Paternoster Row; G. Nicol, Pall Mall; and J. Debrecht, Piccadilly.

to be put in with a Guard, between P. 204 & 205 Vol. II.



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The SCALE. The chief consideration, after the instruments were provided, was the adoption of a COMMON SCALE, applicable to the whole ; and on a simple, selfevident principle ; such a one, as to render the task of registering easy, and the state of the atmosphere obvious, at sight.

It was likewise requisite to adopt such a scale, as would be readily transferable to other instruments of similar intentions ; though not on the same construction : as the barometer (for instance), whether it happen to be constructed, with a single tube, and falls for rain ; or with a double or a quadruple tube, and rises for rain ; or whether it happen to be perpendicular, or horizontal, or of whatever scale or construction.

The principle I fortunately hit upon was this. Having, from constant observation, during three or four years, sufficiently ascertained the *extent of the scale* (marked the highest and the lowest points to which I ever remembered to have seen the fluid rise or fall), I divided this extent into two equal parts ; considering the point of bisection,

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as the point of TEMPERATURE, or medial degree of gravity; and subdividing the spaces, above and below this middle point, into ten degrees, each.

Every man, who has paid attention to his barometer, let it be of any of the descriptions abovementioned, may readily affix to it a *corresponding scale*, and, consequently, will be able to fix a sufficiently precise idea, to the subsequent table: so far as it respects the BAROMETER: and, by a similar rule, will, with equal facility, be enabled to transfer, to his own instruments, the other columns of the register.

It may be said, in objection, that few men have paid a sufficient attention to their barometers, to ascertain, with any degree of truth, the medial degree of gravitude, from their own observations. If this be just, let those who have not, adopt the degree of temperature which the maker has marked upon the instrument, and let them suppose the extent of the scale, until by experience they have corrected and ascertained it.*

* JAN: 1799. If BAROMETERS, in general, had scales, on this principle, affixed to them, by their

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The BAROMETER, THERMOMETER and HYGROSCOPE, in the Plate, are drawings of the instruments, from which the register was made: the ANEMOMETER, RAIN GAGE, and EXHALA'METER, are theoretic drawings, from which no instruments have, as yet, been constructed.

BAROMETER. A double or quadruple tube has one advantage, over a single tube: the degrees of variation are larger, and more distinct; they do not require that close and minute inspection, which a simple mercury tube does: consequently, the task (if it may be called one) of observation is rendered more agreeable. But a double tube being more subject to the influence of the *beat* of the atmosphere, than a single one is, the latter is more correct. †

makers, instead of the improper ones now attached to them,—that is to say,—if the ordinary SCALE OF INCHES were placed, on one side of the tube, and a DECIMAL SCALE, on the other (instead of the scale of the *weather*) they would become much more *practically* useful than they are, at present. See YORKSHIRE, Sect: the WEATHER, for remarks on this instrument.

† JAN: 1799. It is proper to be observed, however, that the influence of heat, on a barometer of the above

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THERMOMETER. The reason why the scale of *Fahrenbeit* was not made use of was, I thought it right, to reduce the scales of the several instruments, to one COMMON PRINCIPLE. It may be proper to mention, however, that the medial point of the scale formed from my own observation, happens to answer to the 54th degree of Fahrenheit: the scale extending, from 18 to 90 degrees.

construction, is feeble, compared with its operation on a well constructed thermometer; whose containing bulb is large, and its tube fine: whereas the tincture of the barometer used on this occasion, (which happened to be the only one in my possession, at the time the register was formed), was chiefly contained in the tube, itself; and, the scale being extensive, the influence of heat could not, *in any material degree*, affect the accuracy of the following table.

In ascertaining ALTITUDES, by the barometer, a high degree of accuracy is required: the decimal part of a degree is, in that case, of considerable moment. But not so in foreshowing the WEATHER, in which even a degree of a decimal scale is seldom of essential import. It is the *fluctuation*, rather than the precise degree, which is chiefly to be attended to, in *practice*: especially when the atmosphere is in a mean state, as to density or weight.

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HYGROMETER. This construction was adopted, on account of its being simple, and, at the time, mechanical. (*a*) A flaxen line (large well manufactured whipcord) five feet long ; (*b*) an iron hand, or index ; (*c*) the fulcrum, on which the index moves. The length of the index, from the fulcrum to the point, is ten inches ; that of the lever, from the fulcrum to the middle of the eye, to which the cord is fixed, is two and a half inches.

The principle, on which this hygrometer acts, is obvious. The air becoming moist, the cord imbibes its moisture ; the line, in consequence, is shortened, and the index rises. On the contrary, the air becoming dry, the cord discharges its moisture.—lengthens,—and the index falls.

It may be true, that no two hygrometers will keep pace with each other, sufficiently to satisfy the *curious*. I will venture to say, however, from seven months close attention, that two hygrometers, on the simple construction abovementioned, have coincided, *sufficiently*, for the **USES OF AGRICULTURE.**

It is true, they diminished in the degree

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of action ; but as the scale may be readily diminished in extent, and as a fresh line may be so cheaply, and so readily, supplied, this is not a valid objection.*

This diminution, in the degree of action, depends considerably on the construction ; the propriety, or rather delicacy, of which rests, almost solely, on this point:—The weight of the index should be so proportioned to the weight of the lever and cord, that the cord may be kept perfectly straight, without being too much stretched. I made one with a long, heavy index ; and, in order to gain a more extensive scale, with a short lever : but, even when it was first put up, it could barely act ; and, in a few weeks, it flagged, and was not able to raise the index, though the air was uncommonly moist. I therefore made another, with the same length, both of index and lever, but with a lighter index, and a heavier lever, so as to gain the proportion abovementioned ; and it has acted exceedingly well ; being that

* And see MIDLAND COUNTIES, Sect: WEATHER, on a necessary point of management of the cord hygrometer.

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which kept pace with the original one, from which the drawing was made.

Every man, who wishes to profit by the hygrometer, should not have less than two. Three or four would be more adviseable. They would then assist, in correcting each other ; and, in case of renewal or alteration, there would be no danger of losing the state of the atmosphere ; which, if only one is kept, must necessarily be the case.

The principle, on which this hygrometer is formed, is not confined to a small cord, and an index of ten inches long : it may be extended to a rope, of any length or thickness, and to an index and scale, of almost any dimensions and extent.

One, or more, on a portable construction, might be found useful. An AXE is the form I have thought of. The edge, graduated, will constitute the scale ; and the handle will receive the cord. This may be hung up, in the shade, exposed to the action of the air ; or, by means of a spike in the end of the handle, it may be placed in the open field. Perhaps, by placing it on fallow ground, it may be actuated by the

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perspiration of the earth ; perhaps, among vegetables, by vegetable perspiration ; perhaps by the means of one, or more probably by the means of several, placed at varied heights, the different degrees of moisture, at different altitudes, may be ascertained, &c.

ANEMOMETER. An instrument to measure the velocity, or the force, of the wind, has, I believe, been considered as difficult to construct. The shops have them, on a variety of constructions : I have not, however, seen any which, in theory, strikes me with utility, in a manner equal to that of which I have ventured to give a sketch.

(a) A common vane (more necessary than an Anemometer to a foreknowledge of the weather, and which is essentially necessary to every farmer). (b, b) The Anemometer (made of the same materials as the vane) fixed to the socket of the vane, so as to veer with it, freely, round the spindle ; and, consequently, to have its flat side always to the wind. In a calm, the Anemometer will hang perpendicularly ; as the wind rises, it will of course be forced out of its perpendicular position, in proportion

* Fig
mometer
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353. WEATHER.

to the velocity or force of the wind, and its degree of force will be pointed out, by the graduated scale, on the vane. The figures being cut out of the plate, or web of the vane,—or, as in the drawing, painted black on a white ground,—they will be rendered conspicuous. The weight of the counterpoise or balance (*c*), the breadth of the web, and the length or extent of the scale, must be in such proportion, as that, by a violent gale of wind, the Anemometer will reach the tenth degree, its utmost extent.*

RAIN GAGE. It is somewhat remarkable, that an instrument, so well understood, and which has been frequently used, should be so difficult to procure. After going to some of the principal instrument makers, in London, I found a copper tunnel, the top of which was to be made of some certain dimensions, and which I was told was the rudiment of a rain gage. But being informed, that the rain water, after it had been collected, was to be gaged, or mea-

* Fig. 1. is a perspective representation of the Anemometer, fixed to the vane: fig. 2. a delineation of the Anemometer, alone.

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sured, by some certain calculation, I concluded to make use of a common tunnel; as by a very little more calculation, and trouble, the quantity of rain might be as exactly ascertained, as it could be, by any other imperfect apparatus.

I did not, however, rest satisfied, until I had thought of one, which might have some claim to perfection. The want, indeed, is so simple, and the way to it is so short, that it seems almost difficult to mistake it.

Fig. 1. (*a*) the top, or tunnel, to be made of copper, or milled iron, exactly circular, and precisely twelve inches in diameter. (*b*) A vessel perfectly cylindrical, and exactly three inches and eight tenths, in diameter, on the inside. (*c*) A collar, fixed to the tunnel, and fitted to the cylinder; so as to keep the tunnel upright,—its top perfectly level,—and prevent its being blown off the cylinder, by the wind. (*d*) A foot, or pedestal, to stand upon; which, though broad in proportion to the cylinder, should be fastened to a plank, block, &c.; as an apparatus of this kind, being necessarily placed in an open exposure, is liable to be

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thrown down by the wind. Fig. 2. is a section of the tunnel.

The proportional dimensions of this rain gage are thus ascertained.

The areas of circles being in proportion to each other, as the squares of their diameters; and the square of the diameter of the top, or tunnel of this apparatus being 144, the square of the diameter of a cylinder, the area of whose base is one tenth of the tunnel, must consequently be 14.4; the square root of which is 3.794733, or, for common use, 3.8 inches.

Consequently, by merely inserting any ordinary rule, or scale, divided into inches and tenths, into the rain water collected by the tunnel, and contained in the cylinder, the exact depth of rain, which has fallen, will be ascertained, to the thousandth part of an inch; for every inch will be one tenth, every tenth, one hundredth, &c.

An improvement, of this apparatus, would be a GLASS CYLINDER; as by a fixed scale, the quantity of rain would be known, by simple inspection, and the evaporation, if any took place, be easily detected.

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EXHALATION GAGE. This is an instrument, which, probably, has never been constructed, in any form; perhaps, it has not before been thought of. The intention of it is the reverse of that of the rain gage; that, ascertaining the depth of rain water, which falls from the atmosphere; this, the depth of naked water, which is exhaled, absorbed, or taken up, by the atmosphere.

(a) May be a cylindrical, or any other *parallel* vessel, of any diameter, or any depth. (b) A glass tube, whose length is exactly equal to ten times the depth of the vessel;—issuing from the bottom, and rising, gradually, until it reaches a height, equal to the top of the vessel.

Perhaps,—a cylindrical vessel, of twelve inches diameter, and three inches deep, and, consequently furnished with a tube, thirty inches long, would be of eligible dimensions, for an exhalation gage; by which dimensions the foregoing sketch was drawn, on a scale of one tenth to an inch.

These dimensions are preferred, for the following reasons: the shallowness of the vessel shortens the tube; and its width will

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give the wind and sun an opportunity of acting, more freely, on the surface of the water, than a narrow deep vessel would admit of.

OBSERVATIONS.

Previously, to a detail of the observations, which I have recently made, I will transcribe a notice, which I took at an early age; with some remarks thereon, written, a few years afterward: together, forming an outline of the theory of rain, which my future observations have uniformly tended to strengthen.

This notice was taken, in crossing the eastern Morelands of Yorkshire, between the Vale of Pickering, and Cleveland. See the MAPS of the RURAL ECONOMY of YORKSHIRE.

“ Before my entrance upon the skirt of the mountain, which forms an easy ascent, there fell a moderate rain: the drops were rather large, than numerous; and the day, to every appearance, was set in, for rain.*

* On inquiry, I found that, in the Vale of Pickering, the country I had left, it continued to be a rainy day.

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As I approached nearer to the hills, I observed them to be sheathed in a fog or cloud. While I rode up the easy ascent, and particularly after I entered the fog (the height which I was then ascending being, in that part, pretty steep), I perceived the drops to diminish in size, and that the higher I mounted the more they diminished; until, having nearly reached the summit, I found myself surrounded by a fine even mist, without one perceptible drop of rain.

While I continued ascending, and while I rode across the summit of the hill, this equal fog continued; but, on descending into a valley, on the other side (this valley is not deep), I began to perceive some small drops of rain: as I descended, the drops grew larger, and the mist rarer, until, having arrived below the cloud, I found myself in the rain aforementioned. But on ascending a second height, the drops again diminished, until I re-entered, gradually, the uniform mists, or cloud.

The inferences I drew, at the time, are these: the small aqueous particles (or glo-

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bules) which, floating in the air, compose clouds, are, by some external impulse, as the wind (which at this time blew strong), or by some internal power, as attraction, caused to unite, and being, by that means, rendered specifically heavier than the air, they begin to descend. But their specific gravity being, as yet, doubtfully greater, than that of the atmosphere, they may not, at first, descend perpendicularly, but may still float in the wind; until having struck, or attracted to them, such other particles, as accident throws in their way, they descend to the earth, in drops of rain.

This seems to account for the largeness of these drops, during a squall of wind, and after lightning; the floating particles being more strongly agitated, under these, than milder circumstances. Under the first, the descent is rendered more oblique, and irregular, whereby not only the smaller but the larger drops may become united: under the latter, it is not, perhaps, so much the agitation of the suspended matter, as the rarefaction of the air, permitting a more easy precipitation. The depth and density of the

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cloud may, at other times, regulate the size of the drops of rain." —

" That the lower part of the atmosphere generally abounds with imperceptible moisture, and that the clouds are only a collection (or visible state) of that moisture, seem evident, from the quick, or, as it were, instantaneous transition, from a clear to a cloudy day; especially within the tropics, where I have seen the most serene, tranquil atmosphere changed, in a few minutes, to the blackest tempest. The clouds do not seem to rise from the sea, nor to be brought from a distant region; but *gather*, until they become livid, and wholly overspread the visible hemisphere: then ensues a violent squall of wind, with rain.

Briefly, the efficient causes of rain seem to be these: the particles of matter which form, in their dissolved state, the crystalline fluid, water, are, as they lie exposed in the sea, or on the surface of the earth, evaporated, or exhaled into the atmosphere. Here they remain, imperceptible, until, by some law of nature (as yet, I believe, unknown) they are formed into visible clouds.

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In this state they become exposed to the wind, and other agitations of the atmosphere: their degree of vicinity to each may, likewise, contribute to a change; but, chiefly, the state of the atmosphere (chemically considered) which yesterday kept them asunder, today admits of their union; and thus becoming specifically heavier, than the medium which before supported them, they begin to descend: and, in their descent, attract to, and fall upon each other; until, being formed into drops of rain, they return to their former liquid state."

I NEXT refer to the foregoing MINUTES on the WEATHER, made prior to July, 1777; and which are the following:

10. On the uncertainty of seasons, in this country.
71. On the effect of drought.
79. Further on the same.
112. On vegetable perspiration.
124. Diagnostics of a wet season.
173. On the hard frost of 1776, and its effects on crops and soils.

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197. A remarkably irregular spring seed-time.

205. Further on this extraordinary spring.

263. A succession of dry seasons.

273. Comparison of the weather, in Surrey and Lancashire.

275. An extraordinarily wet June.

276. Diagnostics of a wet season.

OBSERVATIONS, 1777.

A general view of the SEASONS of this year, and the effects they produced on agricultural vegetables, appear in the foregoing OBSERVATIONS, under the articles,

338. Wheat,

339. Clover,

340. Meadow.

THE FOLLOWING Memoranda, on the weather, were made during the HARVEST of 1777. They were mostly made, when contradictory prognostics presented themselves, at the same time; or when some change of the weather seemed to be portended; or when I was struck with some prognostic appearance, which I wished to prove, from my own observation.

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August 6. A whirlwind (*a*); the sky beautifully mottled with shell-like clouds, and with a deep blue ground (*b*);—the clouds high (*c*); but the air keeps growing lighter (*d*); and the sun set foul (*e*).

7. This morning is very fine; the air swarms with insects (*f*);—the ground is covered with cobwebs (*g*); and salt is as dry as gunpowder (*h*). But the cock crows incessantly (*i*)—and the air still continues to grow light.

(*a*) Whirlwind is here deemed a sign of fine weather.

(*b*) Dark blue sky, the same.

(*c*) High clouds, the same.

(*d*) This mode of communication is adopted, as it conveys, *directly*, the state of the atmosphere, to the mind of every man, let the construction of his instrument be what it may. It is almost needless to observe, that these incidental remarks are chiefly intended for PRACTICAL MEN; many of whose instruments are of the construction of that which is described, foregoing.

(*e*) The sun setting foul, a prognostic of rain.

(*f*) Insects swarming in the air, dubious.

(*g*) The ground clad with cobwebs, a sign of fine weather.

(*h*) Salt being dry, a sign of fine weather.

(*i*) The crowing of the cock, in the day-time, is esteemed, in *this* country, prognostic of rain. Yet in

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8. Every thing portends fine weather, except the barometer (*k*). The sun, however, set dusky: but the clouds, to the east, are beautifully variegated and high.*

9. Still the air continues to get lighter, Last night, the wind got back from N. to S. E. (*l*), and the atmosphere looked tempestuous. But, today, it has got round to the N.; the air has been growing rapidly heavy, all day; and there is every appearance of settled weather.

Yorkshire, the crowing of the cock proclaims a fine day.

(*k*) The air rarefying, slowly, is esteemed to be a certain prognostic of rain; but I have generally found a quick transition to portend it more truly.

* JAN. 1799. SETTING SUN. I have recently found, that the last is a better symptom, than the sun's going down, splendidly, or even clear; which only shows, that the lower region of the western quarter of the atmosphere is transparent, and free from excessive humidity; whereas the rays of the sun, after setting, being reflected by scattered clouds, in the east, proclaim the entire hemisphere to be in a state of transparency, to a considerable height.

(*l*) The wind getting back is esteemed a sign of foul weather. It is said to get back, when it moves from N. to W. &c. and forward, when it shifts from N. to E. &c.

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This has been a false alarm ; not only of the barometer, but of the setting sun,* and almost every other prognostic. But, perhaps, the scale of rain has been so much lightened of late (*m*), that the atmospheric balance now preponderates, in favor of fair weather. And, generally,—perhaps,—settled rain, may be considered as prognostic of settled fair weather.

14. The remarkably fine weather still continues. But, this evening, gnats sing much (*n*) ; and the moon is foul (*o*). The sun did not set very well ; but the canopy is now (half past eight) divinely beautiful. It was loftier (*p*) this afternoon, than I ever remember to have seen

* JAN: 1799. But see the foregoing Note.

(*m*) The months of June and July were most remarkably rainy.

(*n*) The singing of gnats is called a sign of rain.

(*o*) The foulness of the moon (an annular cloudiness round her), the same.

(*p*) The loftiness of the canopy (the apparent concavity formed by the clouds and the azure expanse) is perhaps one of the truest prognostics of fine weather.

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it. The glass wavering (*q*); the wind varying (*r*).

16. Yesterday, the atmosphere looked threatening; but, today, there is every appearance of fine weather.

Therefore;—the loftiness of the canopy was a truer prognostic, than the singing of gnats—the foulness of the moon—the wavering of the glass—and the varying of the wind, taken jointly.

But, perhaps, the atmosphere is not yet sufficiently replenished, with moisture, to be actuated, by ordinary causes.

28. Great quantities of cobwebs on the ground.

29. A drizzly morning.—Geese flew and cackled much. A very fine afternoon, and a finer evening;—the glass wavering.

30. There was an exceedingly fine dew, this morning (*u*); and the windows were

(*q*) The wavering of the barometer I have frequently observed to portend rain.

(*r*) The varying of the wind is also considered as a prognostic of foul weather.

(*u*) A strong dew is esteemed prognostic of a fine day.

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damp, on the inside (*w*). But the sun rose gaudily (*x*); the clouds sunk and grew dense (*y*). It began, about half past nine, to sprinkle (*z*), and continued, till near eleven (*a*), when a drizzling shower set in. During the afternoon, the air has been growing light, remarkably fast; the wind got *back*, from E. to S. W. with complaints of aches and pains (*b*) from all quarters. It has rained hard, all the afternoon.

31. Last night, and this morning, dry and very windy. Eleven o'clock—geese flew, and cackled, remarkably. A fine afternoon.

(*w*) The window damp on the inside—the same.

(*x*) The sun rising gaudily, (the clouds in the east being tinged with an orange colour, called a gaudy morning) is generally esteemed to be a sign of rain.

(*y*) The clouds getting low and dense—the same.

(*z*) To sprinkle (or spit), to let fall a few largish drops.

(*a*) When rain sets in about eleven, or between eleven and twelve o'clock, it frequently continues, during the afternoon.

(*b*) Chronic pains are often truly prognostic. The rheumatic shoulder of an old laborer, and the corns of an old woman, are frequently in the right; yet by no means infallible.

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1 September. A frosty night, and a lovely day.

From the whole of these Observations, it seems probable, that *animals* have no instinctive prescience of the weather (c). They also point out, clearly, that there are few certain prognostics of the weather; as almost every supposed prognosticator has contradicted itself; excepting that,

A high canopy has uniformly foretold fine weather;

A low canopy immediately preceded rain;

A rapid rarefaction of the air portended present rain;

The sun rising gaudily foretold a rainy day; and that

Chronic aches and pains were prognostic of foul weather.

OBSERVATIONS, 1778.

For a general view of the SEASONS of

(c) But these observations are far from being decisive: for if chronical aches (which, if influenced by the weather, become a kind of casual instinct), be truly prognostic, in the human species, why may not animals have natural impulses, equally prescient?

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1778, and their influence on crops, see the foregoing Observations,

245 Clover,

248 Peas,

249 Wheat.

Monday, 20 July. This summer, until today, has been unusually dry.

The sun has almost uniformly set well: sometimes clear, sometimes among broken clouds, and frequently very red. On Friday last, he set remarkably splendid;—on Saturday, somewhat foul;—last night, remarkably gloomy: he sunk behind a mountain of livid vapor, near ten degrees high, and has not since appeared. This morning, before the rain set in, he attempted to force his way, through the veil which was drawn before him, but without effect.

The moon is now in the middle of her last quarter; her influence, therefore, had not, probably, any share in this change of the weather.

The canopy* has been extraordinarily

* That principally imaginary concavity, which is formed by the sky (or properly the DARKNESS OF SPACE), the heavenly bodies, clouds, &c.

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clear, until last night, when the clouds increased, both in number and size. Last night, the canopy appeared exceedingly wild, and tempestuous (thin, livid clouds flying in every direction, with a pale straw-coloured ground). This morning, it was almost uniformly grey, excepting where the sun attempted to perforate it; and, there, the clouds appeared livid, and the ground nearly white.

The barometer has, this summer, shown the atmosphere to be uniformly heavy; excepting once, when it fore-showed a thunder storm. Yesterday, last night, and this morning, the air has got light, very rapidly. It now thunders, and rains hard.

The hygrometer, on Saturday, became dry; yesterday, last night, and this morning, moist.

The thermometer has been hotter, this summer, than perhaps was ever known, in this country; and although it now rains, the air still continues warm.

Wednesday, 29 July. The weather, after the 20th, was uniformly rainy, until Friday

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afternoon; which was fine, and was portended by the setting sun. For,

The sun did not show himself, from Sunday evening, until Thursday. Thursday afternoon was very gloomy; but, just before sunset, the immediate horizon became clear; and the sun, sinking from behind a very opake cloud, had just time enough to show the whole of his disk; setting perfectly clear and splendid. Friday was very rainy, until about three o'clock in the afternoon, when the sun broke out exceedingly bright.

Saturday, 1st August. While the dry weather continued, the hygrometer* remained, about three deg. dry. During the rain, it got to three deg. moist, and por-

* HYGROMETERS are various; and, when we reflect on the implicit confidence which the housewife places, in her salt-box, the carter, in his whit-leather thong, and the sailor, in his shrouds, we must acknowledge them to be, in some degree, prognostic of the weather.

Simplicity and accuracy were the principles on which I wished to construct an hygrometer; and, after having thought of many, I pitched upon that described in the Plate; which I put up, about the middle of July, during very dry weather.

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tended almost every shower. The barometer and the hygroscope nearly kept pace with each other, until today ; when the latter is $2\frac{1}{2}$ deg. moist, and is still getting moister, while the air has been getting uniformly heavier.

Wednesday, 5th August. The weather, since Saturday, has been very fine ; yet I observed, that some peas, which ought to have been ready to carry, did not wither nor dry, nearly in proportion to the wind and sun, which they received. Yesterday, the hygrometer fell from two deg. moist to below temperate, when they dried as much, in two or three hours, as they had before done, in a whole day.

The hygrometer, whether or not it is prognostic of the weather, is a most valuable oracle, to a farmer. For (to repeat the abovementioned incident) yesterday morning, while the hygrometer stood at two deg. moist, the peas of P 3. were by no means fit for carrying ; the halm was green, and the peas soft. About ten o'clock, the hygrometer fell to one deg. dry : and before one o'clock the whole were in good

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order. I went up to a distant part of the farm, and took the teams into the field, merely on the indication of the hygrometer; and found the peas perfectly fit to be carried.

This is a valuable property of the hygrometer, which I had not foreseen; yet, after being known, it appears sufficiently obvious, to have shown itself, in theory; for the air, perhaps, acts as a sponge; and, while it is dry, it absorbs the contiguous moisture; which, when the air itself is moist, is suffered to remain; or, at least, is not taken up, so rapidly, as when the air is dry.

An hygrometer, in this point of view, is obvious and simple: for the same air, which absorbs the moisture of the cord, takes up that of the hay or corn which is exposed to it. Consequently, either of them will become proportionably dry or moist, according to the degree of dryness, or moisture, of the air. But the cord points out the degree, with mathematical certainty; whereas, to know whether hay or corn dries fast, or slowly, recourse must be had to repeated

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examinations; and, on a straggling farm, it may be at two or three miles distance.

Therefore, on a scattered farm, an hygrometer may become, in haytime and harvest, peculiarly useful.

Tuesday, 11th. Today threatened very much, for rain, and the air grew light; but the hygrometer stood at $1\frac{1}{2}$ deg. dry. It sprinkled in the evening; but the rain went off, and the air regained its weight.

Thursday, 13. The air has been growing light, all this day. But the canopy is clear, and the hygrometer stands, firm, at one deg. dry.

Friday 14. During last night, the air has decreased very much in weight. This morning the sun rose clear, but was presently hid, by thick scudding clouds. The hygrometer still firm, at one deg. dry. In about half an hour, the scud flew rapidly off, and the canopy is now (six o'clock in the morning) perfectly clear.

The wind presently got up, blowing very hard: and I had laid it down as a maxim, that, "when the air gets light, but still

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continues dry, it portends wind ;” and was pleased with the apparent discovery, that the hygrometer was the much wished for check to the barometer, showing when the latter portends rain, and when it foreshows wind.

About twelve o’clock, the wind fell, when a drizzly rain set in ; which, however, presently went off. This confirmed me in my opinion ; for I reasoned thus : “ Notwithstanding the lightness of the air, it does not rain, because the air is dry.” This reasoning, however, soon became vague ; for, about three (notwithstanding the air, after the wind ceased, condensed more rapidly, than I ever remember to have observed it) a steady rain set in ; which still (six in the evening) increases ; contrary to every prognostic, natural and factitious !

Saturday 15. The rain ceased just before sunset, which was fine ; and today has been a delightful harvest day. The barometer and hygroscope have kept improving, all day ; the latter stands now (seven in the evening) at temperate.

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The incident of yesterday is positive proof, that there are other causes of rain, than the *lightness* and *moisture* of the AIR: for the atmosphere was, yesterday, neither light nor moist; yet it rained, moderately, during three hours and a half.

But, perhaps, when the atmosphere is heavy and dry, there is no fear of *much rain*: it is, however, proved beyond contradiction, that a summer shower, or even a transient rain, does not depend wholly on the humidity and gravity of the atmosphere, *at the immediate surface of the earth*.

Yesterday's shower came, at right angle to the wind. The wind was S. W. and the rain came from the N. W. or N. N. W.

Tuesday 18. This afternoon, the hygrometer sunk to five deg. dry. Oats, which were mown yesterday, and which, in places, were weedy, are, today, as dry as tinder; the succulent weeds, though as green as when cut, may be rubbed to powder.

Wednesday 19. This morning was foggy. During the fog, the hygrometer got to three deg. moist; but, the fog passing off, it is now (four in the evening) near ten deg. dry!

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It is observable, that the sun is remarkably scorching ; although the thermometer is only five deg. warm. Perhaps, the air being dry, the rays of the sun, meeting with no obstruction, fall unblunted on the skin. In the shade, the air is pleasant.

BY THE foregoing incidents and reflections, I was led on, to a closer investigation of the weather.

The first step I took was to make out a classical

ARRANGEMENT of PROGNOSTICS.

After having made out a miscellaneous list, gathered from my own observations, from popular maxims, from DR. CAMPBELL'S SHEPHERD OF BANBURY, &c. &c. I classed them in the following order.

PROGNOSTICS of SEASONS:

THE reason, for making this distinction, must be obvious, to every one who has made observations on the weather. Every season has its peculiar CHARACTERISTIC; it is either *wet*, *dry*, or *changeable* ; and from the above

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Minutes, as well as from repeated, unmi-
nuted observations, I am clearly of opinion,
that the same prognostics, which, in a fair
season, will bring fair, will, in a rainy season,
bring rain. Therefore, the characteristic of
the season ought to be pointed out, before
the quality of the weather can be foreshown.

Spring, rainy ; serene summer.

January, mild ; bad for grass crops.

February, fair ; wet seed-time, and bad crops.

Feb.-Mar. rainy ; wet spring and summer.

Feb.-Mar. dry ; dry spring and summer.

April, windy ; good crops.

April, showery ; good crops.

May, cold and windy ; good crops.

May, wet ; bad crops.

Summer, hot and dry till the middle of
September,—a cold spring.

Summer, moist and cool ; hard winter.

Summer, serene ; windy autumn.

Autumn, serene ; windy winter.

September, hot and dry ; cold spring.

Oct.-Nov. warm and rainy ; Jan. and Feb.
frosty and cold.

Oct.-Nov. snow and frost ; January and
February mild.

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- Winter*, warm and open ; hot and dry summer.
- Winter*, windy ; rainy spring.
- Winter*, commencing with a south wind ; cold winter.
- Winter*, commencing with a north wind ; mild winter.
- Wind*, easterly the fore part of summer ; dry summer.
- , westerly the latter part of summer ; dry autumn.
- , a week's fair weather, with a southerly wind ; drought.
- Lightning*, without thunder ; drought.
- Cuckoos*, coming early ; hot summer.
- Woodcocks*, ———— ; cold winter.
- Fieldfares*, ———— ; cold winter.
- Acorns*, plentiful ; hard winter.
- Haws*, ———— ; hard winter.
- Hazel nuts*, ———— ; good harvest.
- Broom*, full of blossoms ; plenty.
- Almond*, full of bloom ; plentiful harvest.
- Walls*, sweating much in the beginning of winter ; open winter.

PROGNOSTICS of the WEATHER.

SUN.

Rising orangey ; rain.
 Rising red and fiery ; wind and rain.
 Rising cloudy, if the clouds decrease ; fair.
 Rising dim ; drizzly.
 Rising with the eye half open ; rain.
 Setting foul ; rain.
 Setting red ; wind or rain.
 Setting blue ; rain.
 Setting dusky, and streaked with red ; storm.
 Setting purple ; fine.
 Setting bright : fine.
 Setting behind a dusky bank ; rain.

MOON.

Bright, with sharp tips ; fair.
 Dim, with a ring round her ; rain.
 New moon not appearing till the 4th day ;
 rainy month.
 The lower horn of the new moon sullied ;
 foul weather before the full.
 The middle — ; Storms about the full.

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The upper horn sullied ; foul about the wane.
On the 4th day, bright, sharp, and oblique ;
fair month.

————— dim, blunt, and erect ; rain
Saturday's moon ; rainy month.

ATMOSPHERE.

Cold, after rain ; rain
Cold, in summer ; rain.
Warm, in winter ; rain.
Sultry, in summer ; thunder.
Heavy ; fair.
Light ; rain.
Moist ; rain.
Dry ; fair.

CANOPY.

Red in the evening and grey in the morn-
ing ; fair.
Green between the clouds ; stormy.
High ; fair
Low ; rainy.
Orangey in the morning ; rain.
Deep blue ground ; fair.
Pale blue ground ; rainy.
Lined with streamers ; rain.
Speckled ; fair.

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Resembling the inverted cavity of a ship;
settled fair.

CLOUDS.

Small and white ; fair.

Streaming within the canopy ; rain.

Large, like rocks or towers ; showers.

If small clouds increase ; rain.

If large ones decrease ; fair.

Large clouds, with white tops, and livid
bases ; thunder.

Two such clouds rising on either hand ;
sudden tempest.

Small, ragged, livid clouds, near the sun,
especially when setting ; rain.

If clouds increase rapidly ; tempest.

Fleecy clouds scattered from the east ; rain
within three days.

Waterish clouds on the tops of mountains ;
rain.

Mountains free from clouds ; fine.

High and light ; fair.

Low and heavy ; rain.

RAINBOW.

In the morning ; rainy.

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In the evening ; fine.

The frustum of a rainbow ; rain.

Predominantly red ; wind.

———— green or blue ; rain.

WIND.

Whirlwind ; settled fair.

Continuing in the N. E. three days without
rain ; fair for eight or nine days.

Going backward ; rain.

Unsettled ; rain.

From N. W. to N. E. fair.

From S. E. to S. W. rainy.

RAIN.

Sudden rain seldom lasts long.

Coming on, by degrees, is likely to last
six hours.

Beginning with a high southerly wind, and
the wind falls ; rain for twelve hours.

Beginning before sunrise ; will end before
noon.

A shower before sunrise ; a fine day.

Beginning an hour or two after sunrise ;
a rainy day.

Cold wind after rain ; more rain.

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Setting in, between eleven and twelve o'clock ; a rainy afternoon.

Clearing up, about that time ; a fine afternoon.

A squall of rain or hail ; settled fair.

A rainy Friday ; a rainy Sunday.

A rainy Sunday ; a dripping week.

MIST, or FOG.

A misty morning, and the mist fall ; a hot day.

_____ and the mist rise ; rain.

If general, before sunrise, near the full ; fine weather.

_____, _____, in the new moon ; rain in the old.

_____, _____, _____ old moon ; rain in the new.

DEW.

A heavy dew ; fair.

None ; rainy.

If it vanish, suddenly, or early ; rain.

FROST.

A white frost ; rain within three days.

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SEA.

Suddenly swelling ; tempest.

Making a hollow noise ; storm.

RIVERS.

Sinking more than usual ; rain.

MINES.

Certain fumes rising ; a storm.

The water becoming muddy ; a storm.

An eruption of certain meteors ; a storm.

SOUNDS.

Heard distinctly from a great distance ; rain.

SMELLS.

Unusual, and disagreeable ; rain.

FEELINGS.

A disagreeable langor ; thunder.

The hand feeling dry ; rain.

Chronic pains being more violent than usual ; rain in summer, or frost in winter.

ANIMALS.

Asses,
braying loud and long ; settled
fair.

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- Asses*, braying with difficulty and hoarsely ; rain.
- Sheep*, feeding during rain : a continuance of rain,
- Geese*, washing themselves, more than usual ; rain.
- cackling and flying much ; rain.
- Ducks*, washing and diving much ; rain.
- Cock*, crowing much in the middle of the day ; rain.
- Peacock*, squalling more than usual ; rain.
- Kites*, flying and hovering high ; fine weather.
- Cuckoo*, chattering and stammering ; rain.
- Owls*, screaming in the evening ; fair and frost.
- Larks*, rising high, and singing long ; fine.
- Redbreasts* singing loud, in the open air ; fine.
- faintly, under cover ; rain.
- Swallows*, skimming the surface of water ; rain.
- Dogs*, the nose dry ; rain.
- Moles*, earthing more than usual ; rain.
- Frogs*, appearing of a golden hue ; fine.

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- Frogs*, appearing of a dark, dusky color ; rainy.
- Spiders*, crawling abroad ; rain.
- webs, on the ground, or in the air ; fine.
- Ants*, moving their eggs to dry places ; rain.
- Worms*, creeping in numbers out of the ground ; rain.
- Glow worms*, appearing more than usual ; fine.
- Bees*, staying much about home ; rain.
- flying far abroad, and staying out late ; fine.
- Flies*, peculiarly troublesome ; rain.
- Gnats*, playing in the open air in the evening ; heat.
- ————— shade ; showers.
- stinging much ; cold and rain.
- Fleas*, biting unusually ; rain.

VEGETABLES.

- Burnet*, shutting its flowers ; rain.
- Dandelion*, expanding its down ; fair.
- Trefoil*, the stalks swelling and becoming erect ; rain.

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FOSSILS.

Salt, dry ; fair.

— damp ; rain.

Walls, damp ; rain.

This arrangement, however, by no means answered my wish : instead of strengthening my judgment, it led me into a labyrinth, apparently endless. While I collected it, I was disgusted, with maxims, which I knew to be false, and with others, which appear vague, at first sight. Nothing could have induced me to have classed it, much less to have published it, had it not been for the purpose of recording a system of popular maxims, which have, more or less, engaged the attention of mankind, for upwards of two thousand years.

It is not my present intention, to enter into an analytic investigation of the weather ; yet I cannot refrain from communicating such observations, and reflections, as have occurred to me, and which, I flatter myself, will be considered, as an overture, at least, towards founding a foreknowledge of the weather, on the durable basis of science. It would, indeed, be deserving of a

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harsher term than wantonness, for any man, even to attempt, to throw down a work of ages, without erecting, or at least laying the foundation of another, in its stead, which he is convinced will fill its place, with greater propriety.

Lest this, however, should be thought to be leaving the subject, too abruptly, I will offer the following reasons, in corroboration of those principles, which I have drawn from experience.

Occult qualities being exploded, it will readily be admitted, that the weather is influenced, by PHYSICAL CAUSES. Can animals, vegetables, and fossils, be the causes of rain? can they send forth the humid particles; assemble them in the atmosphere, or call them down in rain? no man will answer in the affirmative. Why, then, consider them, as prognostics of the weather? it may be answered:—they are actuated by the causes. This will, for a moment, be admitted. But supposing them to be actuated, why apply to them? why shall we not investigate the causes themselves, and look

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up to these for information? It will not, however, be implicitly granted, that they are actuated, with any degree of uniformity and certainty; for to what end could this law of nature be instituted? can it be traced to the self-preservation of the individual, or to the propagation of the species? Supposing such an instinct to exist, in the animal creation, it is most likely to be the strongest, in the defenceless tribe of insects; and yet I have frequently seen swallows feeding high in the atmosphere, not only, immediately before, but during the beginning of rain, which has, afterward, lasted for some time. This is presumptive evidence, at least, that even insects have not a prescience of rain. After they have been actuated by the *effect* of the rain, self-preservation, no doubt, leads them to the earth for shelter.

It may, however, be said, that vegetables are not, like animals, subject to the influences of fear, hunger, and lust; their impulse must, of course, proceed, simply, from the causes of rain. If there are vegetables

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which, with regularity and certainty, shut up their organs of fructification, on the approach of rain, such vegetables are truly prognostic of *immediate* rain. But, admitting this, so short a notice, as they hold out, can only be of momentary utility, while the leading causes of rain may, for some days, precede the effect. Besides flowers are transient, even to a proverb, and, while existing, must be sought for, in the field: whereas, FACTITIOUS PROGNOSTICS are ever at hand, ready for inspection.

HAVING thus briefly apologized, for venturing to deviate, from the established principles of prognostications, I will endeavor to explain, more fully, those on which I wish to found a foreknowledge of the weather.

The WEATHER, taken in its largest sense, is THE STATE OF THE ATMOSPHERE: consequently, *to prognosticate, is to foreshow the state of the atmosphere.*

The state of the atmosphere is influenced, or modified, by its variations of density, or WEIGHT; by the quantity of aqueous par-

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ticles it contains, HUMIDITY ; by the invisibility of its contained particles, termed FINENESS ; by the visible collections of those particles, CLOUDINESS ; by a precipitation of those particles, RAIN, &c. by its motion, or WIND ; by FROST ; by its different degrees of HEAT ; by LIGHTNING, &c.

To simplify the inquiry, as much as possible, and to endeavor to render it of ordinary use, I will confine it, principally, to RAIN.

In the atmosphere, as in the animal system, a CIRCULATION is kept up: the evaporable particles, which lie exposed on the surface of the globe, are absorbed by the contiguous air ; wherein they are invisibly contained, or float as visible clouds ; out of which they return as rain, to the earth: from whence they may be again exhaled, again formed into clouds, and again precipitated in rain.

The first inquiry, therefore, towards a philosophical treatise of the weather, is,—in what manner is the atmosphere supplied with HUMIDITY? the next,—what causes and what prevents this invisible humidity, suspended in the atmosphere, from being

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formed into visible CLOUDS? and the last,— what prevents,* and what causes the visible clouds, to be precipitated in RAIN?

These, however, are disquisitions I do not mean to enter into: they are mysteries of nature, which, perhaps, never have been, perhaps, never may be, fully disclosed to human perception. However, while the memories of NEWTON and LINNEUS are recollected, Nature may be pursued, in her most intricate mazes, with at least some hope of success. And, by an acuteness of observation, aided by a course of physical experiments, the philosophy of the weather may happily be rendered as obvious, as the Newtonian principles, or the Linnean system.

Waving, therefore, the primary causes, we will proceed to the more obvious means, or EFFICIENT CAUSES, of rain; and endeavor, by *ascertaining the present*, to *prognosticate the approaching*, state of the atmosphere.

First, it will scarcely be disallowed, that the

* For we frequently see them hover, over our heads, for days, without falling.

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atmosphere, in its most dry and transparent state, contains a portion of humid particles, and that visible vapor, or clouds, are formed from these invisible particles: consequently, clouds cannot be formed, without pre-existent moisture in the atmosphere. And may we not say, that the greater quantity of moisture there is in the air, the greater probability there is of clouds being formed, and of rain falling? This being admitted, THE DEGREE OF MOISTURE in the atmosphere seems to be the first step, towards a foreknowledge of rain.*

The state of the atmosphere, with respect to its moisture, is pointed out by the HYGROMETER: and had we a hygroscope,

* JAN: 1799. The novel discovery, which is said to have been made, of converting a portion of atmospheric air into water, has little, if any, effect on the position, here stated. If it is within the power of chemistry, to decompose atmospheric air (and thereby produce from it *more* water than it had *previously taken up*), it is possible, that lightning may produce a similar effect. But to hold out, that a change of this nature takes place, under the ordinary circumstances of the atmosphere, would be too palpable a bait, even for the credulous in modern philosophy, to catch at.

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which could show, with mathematical certainty, the degree of moisture, *at every altitude*, we should be forward on our way, towards certain prognostication.

But FACTITIOUS HYGROMETERS are placed too near the earth, to point out, with certainty, the degree of moisture contained, in that region of the atmosphere, in which the clouds are formed : for, by an incident mentioned in page 157, the degrees of humidity were various, according to the degrees of height in the atmosphere.

It has been already hinted, in the description of the plate, that, by placing factitious hygrometers, at different heights, the degrees of moisture might be ascertained, at different altitudes. I will here offer other hints. Perhaps, suspend an hygrometer to an artificial kite, or EAGLE, and raise it high in the atmosphere ;—or, to reach a still greater height, send up a suspended hygrometer, from the top of a tower, or high building ;—or, to compass a yet greater space, and to gain a still greater variety, place one hygrometer, at the foot of a hill ; a second, at the foot of a tower, raised

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on the summit of the hill ; a third, at the summit of the tower ; and fix a fourth to an eagle, to be raised from thence. The Royal Observatory, at Greenwich, would afford this variety.

Perhaps, an engine or apparatus of this kind, by whatever name it may be called, may be considerably improved ; and if judiciously made,—by an ingenious workman,—of a proper size,—from fit materials,—and with suitable machinery, it may perhaps be raised, to almost any given height. And, perhaps, not only the degrees of moisture, but those of weight, heat, and motion, of the middle regions of the atmosphere, might, by such a machine, be in some measure, ascertained.*

The bounteous Author of Nature, however, has furnished us with NATURAL HYGROMETERS, which, perhaps, if properly attended to, may be equal to our wants:—I mean, the RISING AND SETTING LUMINARIES. And the luminaries, even in a state of ascension, may be considered as hy-

* JAN : 1799. Perhaps, an aërostatic ball, of a proper size, might be used for this purpose.

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grometers. Perhaps, a bright, *scorching* sun ;—the moon lucid, with sharp horns ;—and the stars twinkling, denote a dry air. On the contrary, the sun and stars faint ;—and the moon blunt ; as also the solar and lunar rings, may indicate a moist atmosphere.

Secondly, it is evident from long continued experience, that the density or WEIGHT of the air influences, in some degree, the atmospheric moisture ; yet it is at the same time evident, from incidents which occur in the foregoing Minutes, that the gravitude of the atmosphere is not the *only* efficient cause of rain. These incidents, however, prove that the weight of the air has a *principal* share in the government of the atmosphere

The state of the atmosphere, with respect to its specific gravity, is ascertained, with singular accuracy, by that admirable factitious prognostic, the BAROMETER.

Third. From the foregoing Minutes, and from common observation, it is evident, that the MOTION of the atmosphere is an efficient cause of rain. Indeed, when we consider the motion of the atmosphere,

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in its largest sense, every other prognostic state seems to be borne away with it ; for that which is the local atmosphere of any given place, today, may, tomorrow, be removed to a considerable distance ; and, if the wind remain stationary, may, in a few days, become the local atmosphere of a distant country. However, while the causes and the laws of wind (if the term may be applied to a subject so apparently lawless) remain little understood, we ought not, perhaps, to rest too implicit a confidence, on the motion which may happen to take place, in the immediate region of our observation. Nevertheless, the motion of the atmosphere, near the earth, may, I think, be safely considered as one of the principal efficient causes of rain.

The motion of the atmosphere is divisible into its DIRECTION, and its VELOCITY, or force. The state of the atmosphere, with respect to its velocity, is ascertained by the ANEMOMETER ; with respect to its direction, by the VANE.

Fourthly. Perhaps the HEAT of the atmosphere (whether it be communicated

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by the sun or the earth *) may be considered as an efficient cause of rain.

The state of the atmosphere, with respect to its heat or warmth, is ascertained (near the earth at least) with a great degree of precision, by the THERMOMETER.

Lastly. Perhaps the QUANTITY OF RAIN, recently fallen, regulates, in some measure, the quantity of rain, presently to fall.

The state of the atmosphere, with respect to its exhaustion, by the quantity of rain recently fallen, is ascertained, with mathematical certainty, by the RAIN GAGE.

* VOLCANOES are evidences of the existence of subterraneous heat. And what are usually termed GROUND THAWS (thaws which do not seem to proceed from any change in the atmosphere) furnish presumptive evidence, that subterraneous heat is sometimes communicated to the atmosphere, through the pores of the earth. Might not this communication be tested, by the assistance of thermometers, placed at different depths, in caverns, or mines? Is it not probable, that the upward progress of the heat (for its passage cannot be supposed to be instantaneous) might be traced, by comparing these thermometers, placed at different depths; and its emission be confirmed, by such as are placed, on the surface of the earth?

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Thus we have enumerated five influencers of the state of the atmosphere; namely, its

Humidity,	Heat,
Gravitude,	and
Motion,	Rain.

And we have likewise enumerated six FACITIOUS PROGNOSTICS, whereby the degree of influence may be ascertained; namely,

The Hygrometer,	Anemometer,
Barometer,	Vane,
Thermometer,	Raingage.

The five latter may be termed perfect instruments: the first is very imperfect; as the degree of moisture may vary at different altitudes. But, in order to regulate this defect, I have pointed out, in the course of these Observations, a natural hygrometer; namely, the appearance of the atmosphere, or rather of the atmospheric canopy; whether that appearance be formed, and altered, by

The Clouds,	Lightning,
The Sun,	The Rainbow,
The Moon,	or the
The Stars,	Aurora Borealis.

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Nevertheless, the ascertainment of the quantity of moisture suspended in the air, remains the most indefinite part of this inquiry; and yet, perhaps, to ascertain this, with some degree of precision, is essentially necessary to prognostication.

There might, perhaps, be an apparatus constructed, which would assist, considerably, the natural and factitious hygrometers, abovementioned, in ascertaining the present state of the atmosphere, with respect to its humidity. I mean, an instrument to ascertain the quantity of moisture exhaled by the atmosphere, from naked water.

Were it not for the motion of the atmosphere, it might, with the assistance of the rain-gage, bring this part of the subject to a considerable degree of certainty. And, when we consider that the same cause which sends forth exhalations, in any certain place, may extend its influence, to a considerable distance; and, when we reflect that changeable winds return, as it were, the same atmosphere, its motion may not be so inimical, to the ascertaining of its moisture, as may at first sight appear.

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Last summer, I sketched out such an instrument, and have given an engraving of it, in the preceding Plate, under the name of an Exhalation gage.

Whether or not this apparatus may prove instrumental to prognostication, it will go near to demonstrate the cause of exhalation: whether it is the dryness of the air;—the weight of the air;—the heat or attraction of the sun;—the direction or velocity of the wind;—subterranean heat, &c.

Beside, it might prove of some importance, to know the proportion which the INHAUSTION of the atmosphere, by *exhalation*, from naked water, bears to its EXHAUSTION, by *rain*; and thereby to ascertain, in a course of years, the quantity of *animal*, *vegetable*, and *fossil perspiration*.

I cannot quit this part of the subject, without mentioning another advantage, which may be expected from an exhalation gage. I find among the rough Minutes of the Weather of 1778, the following memorandum: “ Perhaps there is an IMPERCEPTIBLE COMMUNICATION, between the atmosphere and the earth: perhaps, the

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particles of water, not only rise, imperceptibly, but fall again, without being formed into clouds, or rain. And if there is not an invisible communication, in what superior region lies the *atmospheric ocean*? Where is that vast abundance of watery particles, which must have been exhaled, during this almost rainless summer? for the *air*, by the hygrosopes, natural and factitious, is still *dry*." Whether this conjecture be well or ill founded, will, I flatter myself, be proved, by the exhalation gage.*

IT WAS the middle of August, last, when I digested my ideas, on this subject; and, having determined to throw aside NATURAL PROGNOSTICS (excepting those

* JAN: 1799. That the air is capable of discharging the moisture it has taken up,—without its passing through the stages of precipitation,—is evident, by that which it lodges on the cooled surfaces of glass vessels, on windows, and, when it is peculiarly moist, though perfectly transparent, most perceptibly on every hard smooth surface; and similar quantities are doubtless absorbed, by porous substances.

Whether, or not, the atmosphere discharges its moisture, in *quantity*, on the SOIL, at intervals, during a dry

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abovementioned), I began, on Tuesday the 19th of August, an EXPERIMENTAL REGISTER of the STATE OF THE ATMOSPHERE, on the principles here set forth ; namely, by registering,—at sunrise, noon, and sunset,—the weight, moisture, heat, motion, and appearance of the atmosphere.

season, there is little doubt, I think, of its communicating it, freely, to growing VEGETABLES, and to ANIMALS ; and, perhaps, through the former, to the soil. But this by the way.

STATE OF THE ATMOSPHERE,

From 19 August, to 15 September, 1778.

N. B. h. is an abbreviation of heavy; l. light; m. moist; d. dry; w. warm; c. cool; E. east; N. north, &c. The figures point out the degree of warmth, coolness, moisture, motion, &c. o o. temperate; o N. o S. &c. calm; the wind having gone down at N. or S. the vane standing in that direction. See the Plate and its description.

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August, 1778.		Weight.	Moisture.	Heat.	Motion.	Appearance.	Quantity of Rain.
19. Wed.	Sunrise	6. h.	1. m.	4. w.	2. E.	a thick fog	0. 00.
	Noon	6. h.	2. d.	5. w.	2. SE.	perfectly serene or clear	
	Sunset	5. h.	6. d.	5. w.	0. E.	cloudless, but ruddy (*)	
20. Thur.	Sunrise	5. h.	3. d.	3. w.	0. E.	foggy	0. 00.
	Noon	5. h.	1. m.	4. w.	1. E.	cloudless (1)	
	Sunset	5. h.	4. d.	5. w.	0. NE.	ruddy, and the sun large (a)	

(*) Ruddy; a purplish bloom, which sometimes appears near the setting sun.

(1) During the fog, the hygrometer rose from six deg. dry to two deg. moist. When the fog went off, it got down again to four deg. dry.

(a) The largeness of the rising or setting sun, probably, denotes a moist air.

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August, 1778:				Weight	Moisture.	Heat.	Motion.	Appearance.	Quantity of Rain.
21. Frid.	Sunrise	6. h.	3. d.	3. w.	0. NE.	a ground fog; but the canopy clear	-	-	0. 00.
	Noon	6. h.	4. d.	5. w.	3. E.	cloudless	-	-	-
	Sunset	5. h.	4. d.	5. w.	2. SE.	sun ruddy, canopy high, but not clear	-	-	-
22. Sat.	Sunrise	5. h.	2. d.	4. w.	0. SE.	foggy (a new moon at eight o'clock)	-	-	0. 00.
	Noon	5. h.	0. o.	5. w.	1. E.	a few clouds	-	-	-
	Sunset	5. h.	1. d.	5. w.	1. E.	canopy clear; the horizon foul	-	-	-
23. Sund.	Sunrise	6. h.	0. o.	4. w.	2. E.	cloudless	-	-	0. 00.
	Noon	6. h.	0. o.	5. w.	1. NW.	transparent, grizzly clouds	-	-	-
	Sunset	7. h.	1. d.	5. w.	2. NE.	perfectly clear (new moon not visible)	-	-	-
24. Mon.	Sunrise	8. h.	2. d.	4. w.	1. N.	cloudless	-	-	0. 00.
	Noon	8. h.	2. d.	5. w.	3. N.	cloudless	-	-	-
	Sunset	8. h.	1. d.	5. w.	2. NW.	a gaudy canopy (moon visible and sharp)	-	-	-
25. Tues.	Sunrise	9. h.	1. d.	4. w.	0. SW.	a ground fog, with a clear canopy	-	-	0. 00.
	Noon	8. h.	0. o.	6. w.	3. N.	cloudless	-	-	-
	Sunset	8. h.	2. d.	7. w.	3. N.	canopy clear, horizon hazy, sun ruddy (moon blunt)	-	-	-
26. Wed.	Sunrise	8. h.	2. d.	3. w.	2. N.	ruddy before; red at	-	-	0. 00.
	Noon	8. h.	1. d.	4. w.	3. NE.	a clouded grizzle (b)	-	-	-
	Sunset	7. h.	2. d.	4. w.	7. NE.	canopy clear; horizon foul and watery	-	-	-

(b) The sun was presently hid with a "blight," or haziness, from the NE, which broke into large clouds, about eight. Cold and threatening, all day.

27. Thur.	Sunrise	8. h.	3. d.	2. w.	0. NE.	canopy dusky; horizon clear	-	-	0. 00.
	Noon	8. h.	4. d.	2. w.	6. NE.	cloudy and threatening	-	-	-
	Sunset	8. h.	2. d.	2. w.	7. NE.	canopy cloudy; horizon foul	-	-	-

SOUTHERN COUNTIES.

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27. Thur.	Sunrise 8. h.	3. d.	z. w.	o. NE.	canopy dusky; horizon clear	-	-	0. 00.
	Noon 8. h.	4. d.	z. w.	6. NE.	cloudy and threatening	-	-	
	Sunset 8. h. (c)	3. d.	z. w.	2. NE.	canopy cloudy; horizon foul (d)	-	-	
28. Frid.	Sunrise 8. h.	1. d.	z. w.	2. NE.	cloudless	-	-	0. 00.
	Noon 8. h.	4. d.	3. w.	3. NE.	large clouds	-	-	
	Sunset 9. h.	3. d.	3. w.	2. NE.	canopy cloudy; horizon clear	-	-	
29. Sat.	Sunrise 9½!	3. d.	1. w.	0. NE.	a transparent fog	-	-	0. 00.
	Noon 9. h.	3. d.	2. w.	2. NE.	cloudless	-	-	
	Sunset 8. h.	2. d.	3. w.	0. NE.	clear and serene	-	-	
30. Sund.	Sunrise 6. l.	2. d.	2. w.	0. N.	cloudless and very bright	-	-	0. 05.
	Noon 5. l.	2. d.	3. w.	4. NW.	large clouds	-	-	
	Sunset 4. l.	2. d.	2. w.	6. NW.	tempestuous (e)	-	-	
31. Mon.	Sunrise 6. l.	3. d.	1. w.	0. NW.	bright and cloudless	-	-	0. 00.
	Noon 7. l.	3. d.	2. w.	5. NW.	some clouds	-	-	
	Sunset 6. l.	3. d.	1. w.	0. NW.	red, with a few clouds	-	-	

(c) The wind blew six or seven degrees, all the middle of the day, without any indicative alteration of the barometer.

(d) By the foulness of the horizon is meant that bank of dusky vapour, frequently seen at sunset, resembling a far distant mountain; and which probably indicates a moist air.

(e) Tempestuous; large and livid clouds, with slender watery streams underneath them.

It is observable that this morning was very fine,—the forenoon cloudy,—the afternoon threatening, with a shower about sunset; after which the wind returned, and the air again became heavy. Although the barometer kept getting one degree light every six hours, the hygrometer never varied. The barometer, therefore, without the hygroscopic, only indicated wind with a shower; but not a fall of rain.

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September, 1778.	Weight.	Moisture.	Heat.	Motion.	Appearance.	Quantity of Rain.
1. Tues.	Sunrise 6. h. Noon 5. h. Sunset 5. h.	4. d. 3. d. 3. d.	0. o. 1. w. 1. w.	0. NE 3. N. 0. N.	clear (the first white frost) large clouds canopy wild; horizon gloomy and ruddy.	0. 00.
2. Wed.	Sunrise 5. h. Noon 4. h. Sunset 4. h.	2. d. 2. m. 1. m.	1. w. 2. w. 2. w.	1. NW. 3. N. 1. NW.	a hazy morning. About 7 a drizzle set in, which went off about 9. Before 12 began to drizzle again: soon went off. Afternoon threatening. Sun set red and gloomy (f)	0. 00
3. Thur.	Sunrise 4. h. Noon 4. h. Sunset 4. h.	1. m. 2. m. 3. m.	1. w 3. w. 3. w.	2. NW. 0. NW. 0. NW.	the morning grey. The sun rose obscure. Broke out about 9. Fine day. About 6 began to drizzle, and lasted till 8	0. 07.
4. Frid.	Sunrise 5. h. Noon 4. h. Sunset 5. h.	1. d. 1. d. 2. d.	1. w. 2. w. 3. w.	1. NE 2. N. 1. NE.	a fine clear morning an exceeding fine day the sun went down obscure	0. 00.
5. Sat.	Sunrise 5. h. Noon 5. h. Sunset 5. h.	3. d. 3. d. 4. d.	1. w 2. w. 2. w.	2. NE. 4. N. 0. N.	the sun rose clear, with a very opaque canopy, which presently broke into fleecy clouds. A fine day. Sun set clear	0. 00.

(f) During the first two weeks of this register, I took the appearance which presented itself, merely at sunrise, noon, and sunset: except when something observable occurred, and then I minuted it as an extra observation. But during the last two weeks, instead of taking the appearance, as it happened just at noon, I have given a sketch of the changes of the appearance of the atmosphere, during the day; which sets the information in a fuller, clearer, and more interesting light.

6. { Sunrise 5. h. / 2. d. / 0. o. / 2. N. / a fine grey morning
Noon 4. h. / 4. d. / 2. w. / 4. NE. / the afternoon bleak

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6. Sund.	Sunrise 5. h. 2. d. 0. o. 2. N. Noon 4. h. 4. d. 2. w. 4. NE. Sunset 4. h. 2. d. 3. w. 6. NE.	a fine grey morning the afternoon bleak the evening fine and clear	- - - - -	0. 00.
7. Mon.	Sunrise 4. h. 0. o. 1. w. 4. NE. Noon 3. h. 1. m. 1. w. 6. NE. Sunset 3. h. 0. o. 2. w. 5. NE.	a dull bleak morning, followed by very large snowlike clouds, with a dark blue ground or sky; accompanied with flying showers. The sun set wild.	- - - - -	0. 05.
8. Tues.	Sunrise 5. h. 1. m. 2. w. 2. NE. Noon 5. h. 1. m. 2. w. 4. NE. Sunset 5. h. 2. d. 2. w. 2. NE.	a fine clear morning. A pleasant mild day, with some slight flying showers. The sun set broken (g)	- - - - -	0. 04.
9. Wed.	Sunrise 6. h. 1. d. 2. w. 0. NE. Noon 6. h. 1. d. 3. w. 3. NE. Sunset 5. h. 2. d. 3. w. 0. NE.	a gloomy, foggy morning. About 10 the fog rose and broke into large clouds, with a dark blue sky. A fine mild day. The sun set obscure (b)	- - - - -	0. 00.
10. Thur.	Sunrise 4. h. 1. d. 3. w. 0. NE. Noon 3. h. 1. d. 3. w. 3. NE. Sunset 2. h. 0. o. 2. w. 0. NE.	a fine grey morning. The day mild as spring. The sun went down broken and foul (i)	- - - - -	0. 00.
11. Frid.	Sunrise 1. h. 0. o. 2. w. 3. SE. Noon 0. o. 0. o. 3. w. 0. S. Sunset 0. o. 0. o. 2. w. 1. S.	the morning very dull. About 10 began to rain very hard, before a few violent claps of thunder. Rained till half past 1. A fair afternoon. Sun set red and cloudy (k)	- - - - -	0. 49.

(g) Broken; partly obscured by small, broken, ragged clouds.

(h) Obscure; entirely hid by large common clouds.

(i) Broken and foul; partly hid by broken clouds; and the parts which were visible rendered dim by the foulness of the atmosphere.

(k) Red and cloudy; large clouds tinged with red.

But during the last two weeks, instead of taking the appearance, as it happened just at noon, I have given a sketch of the changes of the appearance of the atmosphere, during the day; which sets the information in a fuller, clearer, and more interesting light.

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September, 1778.		Weight.	Moisture.	Heat.	Motion.	Appearance.	Quantity of Rain.
12. Sat.	Sunrise	0. 0.	0. 0.	2. w.	3. SW.	a fine clear morning. The day threatening; continued	0. 00.
	Noon	0. 0.	0. 0.	3. w.	5. SW.	fair, here; but some flying showers about. A fine	
	Sunset	0. 0.	1. d.	2. w.	0. SW.	evening. The sun went down clear -	
13. Sund.	Sunrise	3. h.	2. d.	2. w.	1. NE.	a fine bright morning. The middle of the day mild and	0. 00.
	Noon	3. h.	2. d.	2. w.	2. NE.	gloomy; but on the whole a pleasant day. The sun	
	Sunset	4. h.	1. d.	1. w.	0. NE.	set broken and red -	
14. Mon.	Sunrise	5. h.	2. d.	0. 0.	0. N.	a thick fog, which fell about 9	0. 00.
	Noon	5. h.	1. d.	2. w.	1. NE.	a remarkably serene, pleasant day	
	Sunset	6. h.	2. d.	2. w.	2. NE.	the sun set clear and ruddy	
15. Tues.	Sunrise	7. h.	2. d.	0. 0.	0. NE.	a thick fog, which fell again about 9	0. 00.
	Noon	6. h.	0. 0.	2. w.	2. NE.	a lovely fine day	
	Sunset	6. h.	0. 0.	2. w.	1. NE.	and a delightful evening (1)	

(1) It is very observable, that the *rising* of the *fog*, on Wednesday, seems to have assisted in giving foulness to the atmosphere; whereas its *falling*, on Monday, and Tuesday, rendered the air unusually pure.

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The reasons for not continuing this register, farther than the middle of September, are these : the more we simplify an inquiry, especially one so abstruse as is this under consideration, the sooner, probably, we shall arrive at some degree of truth. The operations of agriculture, which are more particularly subject to the weather, are principally confined to three months in the year ; namely, from the middle of June, to the middle of September.

A foreknowledge of the weather, in other parts of the year, is of much less estimation. Would it not, then, be embarrassing the inquiry, if it were extended, indiscriminately, to every part of it? May not the same state of the atmosphere, which, in winter, prognosticates fair weather, in summer, be succeeded by rain? To mention one instance : in winter, we seldom have much rain, while the air continues *cold* : in summer, we may have showers, but we rarely have a fall of rain, while the air remains *hot*.

This is not mentioned, as an invariable rule ; but is given in evidence that there

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may be distinct prognostics, adapted to the different parts of the year. Why, then, should we risk this deception? Beside, there is scarcely any man, let him be ever so assiduous, who is equal to the task of circumspectly registering the state of the atmosphere, morning, noon, and evening, for three hundred and sixtyfive days, successively. Whereas, on the other hand, there is scarcely any man, who is engaged in the operations of agriculture, to whom such a register, during the three months above-mentioned, would not be an amusement. In haytime and harvest, every cloud, every change of the wind, and alteration of the barometer, is an interesting incident, which fixes the attention. And who will deny, that a man, who has an amusement in the execution of a plan, is more likely to succeed, than one to whom the performance is labor? When we have reduced a foreknowledge of the weather, in haytime and harvest, to some degree of certainty, we may then presume to work, by a larger scale.

A formidable objection to this mode of inquiry, naturally presents itself; for it

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has been already said, and with a great share of truth, that the same prognostics, which, in a rainy season produce rain, will, in a fair season, produce fair ; how, therefore, are the SEASONS to be prognosticated, by confining the register to three months in the year ?

I am sorry to be under the necessity of saying, in reply to this objection, that the PROGNOSTICATION of SEASONS, to any degree of certainty, is, at present, I am afraid, placed at a distance, from human reach. When we consider how difficult it is, to-day, to prognosticate the weather of to-morrow, what hope have we of foretelling, in winter, what seasons we shall have, in the ensuing spring and summer ? Until we are better informed, with respect to the WEATHER, it seems presumptuous to think of prognosticating the SEASONS ; especially when we consider the *continued series* of dry seasons, which have happened, since July, 1777, and which still continue. That we have not in this country any *regularity* of seasons is evident, from the spring-like winter, and the summer-like spring, of this

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year. And I will venture to say, that, at present, we have no prognostics of seasons which merit the smallest degree of attention, from reason and common sense.

Another objection may be started: if different seasons have their peculiar prognostics of the weather, and if this difference in seasons cannot be foreshown, how are we to come at any degree of certainty, with respect to a foreknowledge of the weather?

It may be replied,—prognostics of seasons are in a great measure *unnecessary*, to a foreknowledge of the *weather*; provided we can ascertain, with any degree of precision, the *DIAGNOSTICS OF SEASONS*;—I mean, the discriminating *characteristics*, or symptoms, which attend a *dry*, a *wet*, or a *changeable season*; and this perhaps is all that can be of real use, towards a prognostication of the weather.

It would, no doubt, be advantageous to the husbandman, to have a foreknowledge of *SEASONS*; especially with respect to the *time of sowing*, and the *quantity of seed* (See *Observation*, p. 144); as also to regulate his

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pasturing stock, &c. And I have arranged, in the foregoing list, such maxims as I was able to collect, on this subject; though I will candidly confess myself too great a sceptic, in popular prognostics, to place any dependance upon them.*

The only PROGNOSTICS OF SEASONS, which have ever occurred to me, as in any degree rational, or scientific, are the quantity of rain, and the motion of the atmosphere; particularly *stationary winds*.

It seems reasonable, that the quantity of rain, which fell, in the past season, should regulate, in some measure, the quantity to fall in the ensuing season. However, the continued series of dry seasons, which have happened, within the last two years, are presumptive proof, that this is not a certain prognostic of seasons; for although an extraordinary quantity of rain fell, in the spring, and former part of the summer, of 1777; yet that quantity, perhaps, was by

* I do not mean, by this, to intimate, that there are no PROGNOSTICS OF CROPS: I speak of the seasons as they are characterized, by the state of the atmosphere. Crops are evidently influenced, by the seasons

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no means equivalent to the dry weather we have since had.

The quantity of rain may, nevertheless, influence, in some degree, the characteristics of seasons; and as the attention required, in ascertaining it, especially by any one who is possessed of a mathematical rain gage, is inconsiderable, it certainly merits that attention, throughout the year.

With respect to the MOTION of the ATMOSPHERE, or WIND, the sudden changes may not only influence the weather, but its stationary tendency may, in a great measure, regulate the CHARACTER of the SEASONS; and, notwithstanding a minute register of its momentary variations, through the year, would be a laborious task, the observance of its principal changes, with the continuance and velocity of its more STATIONARY WINDS, would require a less rigid attention.*

which *precede* and *accompany* their early growth; in as much as they influence the *state of the soil*, and the *constitution* or *habits* of the *plants* themselves.

* JAN: 1799. Some attempt has recently been made, to ascertain the PROGNOSTICS of SEASONS: but

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BRIEFLY,—the following appear to be the objects which the agricultor ought, at present, to hold in view, with respect to a prognostication of the weather ; namely, to keep a MINUTE REGISTER of the state of the atmosphere, during the HARVEST MONTHS ; to register the QUANTITY OF RAIN, and the STATIONARY WINDS, during the year ; and to endeavor to ascertain the DIAGNOSTICS OF SEASONS.

Perhaps, the barometer remaining stationarily heavy ;—the natural hygrometers indicating a dry air ;—the canopy high ;—and the wind north-easterly ; may be considered as DIAGNOSTICS OF SETTLED FAIR. On the contrary, the atmosphere remaining for several days, light and moist ; the canopy low, with the wind fixed at south-west, are perhaps, in this country, DIAGNOSTICS of a WET SEASON.

HAVING thus taken a general view of a register of the state of the atmosphere, and as I flatter myself the foregoing spe-
nothing results from it, which can be useful to the practical husbandman : the *winter seasons*, and the *stationary winds*, are wanting. See Dublin Society Paper, Vol. V.

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cimen may prove an inducement, to others, to keep one, on the same principles, I will proceed to explain, more fully, its several columns.

WEIGHT. The fractional parts of degrees are purposely omitted, for the sake of perspicuity. "One degree heavy," or "three degrees light," conveys, immediately, a clear and precise idea; but "one degree and three quarters heavy," or "one degree and fortyfive minutes heavy," or "one degree, seven tenths, and five hundredths heavy, &c." is destructive of perspicuity, without adding an iota to useful accuracy.

MOISTURE. This column must not be considered, as giving the moisture of the atmosphere, in a general sense; but its degrees of moisture, near the earth. However, as the degrees of moisture, in the lower and the middle regions of the air, may be regulated by some general ordinance of nature, this may prove a useful column, in a register of the state of the atmosphere. As, by comparing it with the column, appearance, this natural law may be fortunately discovered.

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HEAT. The plate, and what has been said under the head weight, sufficiently explain this column. I cannot, however, refrain from remarking, here, the exact coincidence of the point of temperature, or medial degree of heat, which I laid down, from my own observation (see page 208.), and the point of temperature, which is marked on the scales of Reaumur and Fahrenheit.*

MOTION. The direction was taken from a well veering vane, placed in a good exposure. The fractional points are here omitted, as the fractional parts of degrees are in the other columns, and for the same reason ; for, to a man unexpert in boxing the compass, N. N. E. by N. (for instance) would require some reflection, before a competent idea could be affixed to it ; whereas N. E. conveys, immediately, an adequate

* Since writing the above, I have been informed, that the point of temperature, marked on these scales, was ascertained, by placing a thermometer, in a cave, where the variation of heat was small ; and the exact point was fixed upon, by taking the medial degree of heat, in the cave, in the same manner as I took it, in the open air.

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idea to every man. I have therefore taken the nearest direction, to the eight principal points of the compass ; with a full conviction, that this is all which can, at present, be useful.

Being destitute of an anemometer, the velocity was estimated, by its effect on the senses, by the motion of the trees, &c. The scale of motion, from a calm to a hurricane, was supposed to be divided into ten degrees: thus 0 signifies calm ; 1 and 2, a gentle breeze ; 3 and 4, a moderate breeze ; 5 and 6, a brisk wind ; 7 and 8, a strong wind ; 9 and 10, a violent gale.

APPEARANCE. This column is exceedingly difficult to register : the appearances of the atmosphere are innumerable, and the terms whereby to describe those appearances, exceedingly confined. The rising and the setting sun, alone, give a variety of distinct appearances, each of which ought to have a technical name or phrase assigned it ; so that the precise idea might be registered and communicated. The same may be said of the appearance of the clouds ; and any man who would analyse the

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ATMOSPHERICAL APPEARANCES, and assign to each of the most striking a distinct and expressive TERM, so as an adequate idea of each might be, readily, and clearly, communicated, would be rendering an essential service to this interesting subject.

Perhaps, the most scientific manner, of doing this, would be, to catch the different appearances, with the pencil; and affix to each drawing, a concise term, or epithet, expressive of the appearance it represents. This, to a philosophic mind, would be a delightful employment.

HAVING thus ventured to explain the foregoing specimen, as a MODEL, I will now proceed to speak of it, as a REGISTER.

It must not be expected, that any thing conclusive can be drawn from one month's observation; and more especially from the observation of a month, so uniformly fair, as was that in which the above register was formed; there being only one variation, one valuable incident, during the whole of the month. However, as it is from incidents, like that of the 11th of September, we must

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hope to profit, by a register of the state of the atmosphere, let us take a view of the several columns, prior and subsequent to that day.

The half inch of rain, which fell the 11th of September, was obviously foreshown, by the WEIGHT of the atmosphere, eight and forty hours before it fell ; the air becoming regularly lighter, during that time, at the rate of about one degree, every eight hours. Neither the MOISTURE, nor the HEAT, of the atmosphere, gave any useful indication ; nor did its MOTION vary, until the morning of the rain. Yet the APPEARANCE of the SETTING SUN portended it, for three days ; but, most especially, the evening before the rain. The shower was attended with some violent claps of thunder.

To close the incident, here, a conclusion might be drawn, very much in favor of the barometer, and the setting sun ; but if we continue it, to the next day, we are embarrassed ; for the same state of the atmosphere (some difference in the appearance of the setting sun excepted), which, on Friday, brought half an inch of rain, on

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Saturday, gave a fair day! Nor does any rational conjecture offer itself, why a continuance of the same state of the atmosphere should not have brought a continuance of rain; unless it be that the moisture of the atmosphere received an *extraordinary stimulus*, by the THUNDER and LIGHTNING, which attended the rain;* and the air being, by this means, suddenly exhausted of the principal part of its moisture, the rain of course ceased.†

* ELECTROMETERS. Perhaps, had not the atmosphere received this *shock*, it might have retained its moisture, still longer, and its weight and motion changing suddenly after, this rain might not have fallen. Admitting this conjecture, a foreknowledge of LIGHTNING is essentially necessary, to a foreknowledge of RAIN. And if lightning and ELECTRICITY are the same, ought not the electricity of the atmosphere to have a column in a register of the weather? it is true, that a *terrestrial electrometer* would be liable to the same circumscription, as the terrestrial hygrometer; but might not an *atmospheric electrometer* be raised, in the manner hinted for the atmospherical hygrometer? and might it not be productive of ascertaining *electrical appearances*, as well as the latter may be of ascertaining the appearance of humidity. See page 255.

† The rain was unusually heavy.

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We may extend this conjecture, by saying, that the setting sun, on Friday, denoted some remaining moisture; which moisture being exhausted, by the showers which, on Saturday, fell in different parts of the country—and, the atmosphere on Sunday, becoming heavy, and the wind getting round to N. E.—the weather, of course, returned to SETTLED FAIR.

These, however, are only probable inferences, and no positive conclusion must be hoped for, from a single incident. Yet, if we are enabled to reason, with some degree of consistency, on one, what may not be expected from a variety of similar incidents? and if one month affords us an interesting fact, what may not be expected from twenty years accurate observation? I do not mean the observation of one man, in one place, but the joint efforts of many, in a variety of places. What beneath certainty can be the result? I mean, that twenty years accurate observations, made in different parts of the Island, will either afford some certain prognostics, whereby future generations will be considerably benefited;

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or it will be known, with a degree of certainty, that a foreknowledge of the weather is a mystery of nature, placed wholly beyond human reach. And I hope I may be permitted to say, without incurring any unfavorable imputation, that the bare attempt will reflect honor, on the country it may be made in.

HAVING thus submitted the self experience I have hitherto had, with respect to the weather;—having given a prognostical arrangement of popular maxims relative to this subject;—and having ventured to make an overture, towards SCIENTIFIC PROGNOSTICATION, I will conclude this article, with offering up my most earnest wishes, that men of leisure and observation may bend their attention, towards this useful and interesting subject; and that men of science may unite their efforts, in rescuing this important department of human knowledge, from the hands of vulgar error, and in founding a foreknowledge of the weather, on the principles of science, and the unvarying laws of nature.

354. BEASTS OF DRAFT.

354.

BEASTS OF DRAFT.

I AM still clearly of opinion, that OXEN are equal to *every* department of agriculture, and that whatever FARM HORSES *do*, oxen, of a proper make, and properly managed, *can do*. Yet I am still of opinion, that the working of oxen will not, in this country, become general, until some restraint on the breeding of horses shall take place, or the working of oxen be promoted, by some extraordinary exertion of public spirit, or public munificence; and that it is an object of national import, need not here be urged.

JANUARY, 1799. I make use of this opportunity, to mention an idea, which has frequently struck me, but which I have hitherto omitted to register, respecting the SHOEING OF OXEN: namely, that of *slinging* them, instead of *casting* them, or of *confining* them, in a standing posture.

354. BEASTS OF DRAFT.

A method, I apprehend, might be adopted, which would render the operation easy and safe, both to the animal and the operator.

355.

I M P L E M E N T S.

WHETHER my invention was wearied, or whether it was satisfied, with respect to agricultural implements, I am not a judge: I can only say, that since finishing the bury-surface plow, I have found no occasion, which prompted me to increase the number of instruments of husbandry.

Time and constant using are the only tests of farming utensils; and I can, with the strictest truth, declare, that, after one, two, three, or four years *common use*, I have found WOODEN OX-COLLARS, the BURY-SURFACE SWING-PLOW, CONCAVE HARROWS, and the LAND PLANE, superior to any other implements, I have ever made use of, for

355. IMPLEMENTS.

the purposes for which they are severally intended. And without any other motive, than the honest fame, which every man has a right to aspire at, added to an earnest desire of promoting, to the utmost of my abilities, the agriculture of this country, I will not hesitate to recommend them, to the attention of every farmer, to whose soil and situation they are adapted: namely, the PLOW* and HARROWS, for every soil, which requires to be raised into narrow ridges:— the LAND PLANE, for light soils, and for every soil, which requires a smooth surface, more especially for leying: and WOODEN OX-COLLARS, for every soil and situation; especially for strong retentive lands, which require to be plowed with a *single* team.

* It may be mentioned, here, as it was omitted, in describing these implements, that the CRESTING IRON, like the whip rein, is fixed upon the sketch of this plow, merely for the sake of description; its use being superseded, when the skim plow is prefixed.

356. CLASSING FARM LANDS.

356.

CLASSING FARM LANDS.

I CANNOT refrain from saying, here, that I have sufficiently experienced the conveniency of classing small arable fields (See MIN: 165.) and considering each class as one large field, to recommend it to others. Indeed its utility is so self-evident, as scarcely to admit of recommendation.

The propriety of setting out a few acres, near the homestall, for FARMYARD GARDEN-GROUND, is equally obvious.

The part which I laid out, for this purpose, contains seven acres and a half of sandy loam, situated nearly contiguous to the farmyard. This I divided into five plots, of equal size; to receive, in succession, *potatoes, wheat, clover*, (for green forage, as well as to prepare the soil for) *cabbage* (for which it is naturally too loose), *turneps, &c. &c.*

356. CLASSING FARM LANDS.

Different soils, situations, and outlines of practice, require different suites of crops. The principle of management is all that is here meant to be conveyed.

For raising roots and green forage, for store hogs, and occasionally, for milking cows, and working cattle and horses, I have found a GARDEN FIELD peculiarly convenient: not only as furnishing a supply of those articles, *every year, at hand*; but as saving the larger fields, or divisions, from being encumbered, with small plots of produce. See MINUTE 248.

357.

FENCE S.

By EXPERIMENT 320. Pruning the plashers, and filling in with naked rods, gave a better fence, than plashing the quick, rough, and filling in with sprayey boughs.

And a live roddle hedge, by the side of a ditch, adapted to the soil it is made in, is,

357. FENCES.

perhaps, the ultimate of farm hedgemaking. For it is not only an immediate fence, against every species of pasturing stock; but, if kept pruned, will remain such, during the usual term of a lease.*

To see ditches overflowing, with every shower, and hedges looking russety in June, is disgraceful to a cultivated country; especially to one which stands so forward, in the improvements of agriculture, as does this country. But, until the farms of arable fields are rendered less crooked; the ditches of wet land farms are made deeper; and the hedges, throughout the kingdom, wear a verdure in summer, let us not boast of superiority, either in the uses or the ornaments of Agriculture.

How convenient it would be to the plowman,—how advantageous to the farmer,—and how much neatness would it give to the face of the country,—were farms, universally, divided into square fields, with well pruned live hedges.

* For an improved method of performing this operation, see MIDLAND COUNTIES, section FIELD FENCES.

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By PRUNING is not meant, that the hedge should necessarily be rendered low: on grazing farms, where shelter is wanted, they should only be pruned, on each side; so as to render the upper parts close, as a skreen, and to prevent the bottom shoots from being destroyed, by the dripping of the upper spray;—whereby the lower part of the hedge soon becomes naked, and open; and is, consequently, no longer a fence, against the smaller agricultural animals.

Those who plant TREES in HEDGES, by way of *shelter*, deceive themselves, and punish their pasturing stock. For, instead of breaking off the wind, trees add strength to it (as the piers of a bridge increase the rapidity of a river); and the brute, which flies to them for protection, is subjected to additional severity.

A quick hedge, pruned in such a manner as to be rendered thick at the bottom, is a shelter for cattle, nearly equal to a wall, of similar height.

358. SUCCESSION.

358.

S U C C E S S I O N .

THE succession of crops (or rather of the occupants of the soil, whether crops, or fallow) may be regular or irregular. The aboriginal farmers of this country observe no regular rotation ; but crop their fields with what judgment, or caprice, points out. A regular succession, however, is not a modern invention ; as many of the common field lands, in England, have been subjected to it, from time immemorial.

That a regular round is convenient cannot be denied ; and that it ought to be adopted by every young farmer, is equally evident. Nevertheless, a man of mature judgment, may perhaps, tread a more profitable path, by a less mechanical guide ; especially in the neighborhood of a good market.

358. SUCCESSION.

A regular succession ought to be adapted to soils and situations. And, perhaps, the only general rule, which can be given, respecting it, is, to adopt a rotation which will keep the soil clean and in heart ; and, at the same time, afford a supply of such vegetables, as are best adapted to the given soil, climature, market, and consumption, taken jointly.

359.

TIME OF SOWING.

THE TIME OF SOWING, taken in a general sense, is, perhaps, the most important department of the seed process. The same elements and operations, which would give a good crop of wheat, for instance, provided the seed was sown in autumn, would, if the time of sowing was deferred, until late in the spring, be only productive of straw and chaff. And it is observable, that even a few days difference, in the time of sow-

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359. TIME OF SOWING.

ing, either in autumn, or in spring, sometimes make an obvious difference in the crop.

To ascertain, precisely, the properest time of sowing, is perhaps a difficult task; and, if ascertained, could not, in a strict sense, be generally useful, to the farmer; more especially the stiff-land farmer. For his beasts of draft being in due proportion, to the size of his farm, he must, in some measure, be guided, by other operations, incident to his profession; as also, by the state of his soil, with respect to its moisture, tillage, &c. and cannot, like a gardener of a few rods, or a cultivator of a few loamy acres, sow on the day and hour he pleases.

Linneus, nevertheless, merited much applause, when he recommended to his disciples the observance of the FOLIATION OF TREES, in hopes that some general benefit might thereby arise, to mankind, and more particularly to the farmer, with respect to the time of sowing.

Mr. Stillingfleet, who published translations of several valuable papers, read at the university of Upsal, (among which is one

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on the Foliation of Trees) has given a CALENDAR OF FLORA, which he formed in Norfolk, in the year 1755. His motives for publishing it were twofold ; first, to compare it with a Swedish calendar, made the same year ; and next, to induce his countrymen to make similar observations.

Mr. Stillingfleet's tracts falling into my hands, this spring, I was struck with the different degrees of forwardness, of the spring of 1755, and that of the present year, 1779 ; and was led to mark down this difference, in the margin of Mr. Stillingfleet's Calendar.

Finding the task agreeable, and the comparison appearing interesting, I was induced to make out a catalogue of such PLANTS, and BIRDS, as were most likely to fall under my observation. But it being towards the latter end of February, before I made out this list, and became accurate in my observation, some of the early plants had slipt my notice, entirely, and others I was obliged to register from recollection. However, I did not insert any, but such as I could recollect, with a sufficient degree of

359. TIME OF SOWING.

accuracy : and Mr. Stillingfleet having observed, that the spring of 1755 was backward, and this spring of 1779 being unusually forward, I am induced to offer to the public the following Register, as being exhibitory of a striking contrast, between a late and an early spring ; as well as to introduce, with greater propriety, the inferences I drew from it.

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*A COMPARATIVE VIEW of the PROGRESS of
VERNAL VEGETATION in ENGLAND, in
the Year 1755, with that of the Year 1779.*

	NORFOLK. SURREY.	
	1755.	1779.
Hazel catkins full blown -	Feb. 22.	Feb. 10
Goosberry began to foliate -	— 25.	— 10.
Sallow catkins full blown -	March 11.	— 20.
Violets full blown -	— 28.	— 14!
Primroses full blown -	— 29.	— 7!
Birch 'leaves quite out' -	April 1. (a)	April 7.
Bramble 'leaves quite out' (b)	— 3.	—
Cleavers began to spring -	— 3.	Feb. 21!
Briar (dog-rose) 'leaves quite out' -	— 4.	Mar. 4.
Swallow returned -	— 6.	May 8! (c)
Filbert 'leaves quite out' -	— 7.	— 25.
Sallow 'leaves quite out' -	— 7. (d)	April 7.
Lilac began to leaf -	— 7.	Mar. 4.
Nightingale began to sing -	— 9. (e)	— 28.

(a) BIRCH. This I should imagine to be erroneous; as the observation I made this year was very accurate.

(b) BRAMBLE. It is observable, that the winter being remarkably mild, many brambles preserved their foliage and verdure; so that it was difficult to say when they came into spring leaf.

(c) SWALLOW. This was the first day I saw one; yet some stragglers were said to have been seen a fortnight or three weeks before that time; but even now (the middle of May) swallows are still rare! notwithstanding the uncommon forwardness of this spring. May we not say—perhaps, swallows in general migrate; but, perhaps, some few remain dormant in the island, during winter?

(d) SALLOW. This and the filbert, I apprehend, are mistakes; not only from this year's observation, but from common observance of the lilac, which is an earlier shrub, than either of them; whereas, they appear to have foliated, when the lilac is only *beginning* to foliate.

(e) NIGHTINGALE. In 1776 I heard her, first, on the

Elm (na
foliate
Turneps
Damson
Cuckoo
Oak beg
Blacktho
Pear tree
Cherry i
Hawtho
Walnut
Wallflow
Ash 'le
out'
Furze in
Lilac in
Hawtho
Cowslip
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SOUTHERN COUNTIES.

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NORFOLK SURREY.
1755. 1779.

Elm (narrow leaved) began to foliate - -	April 10.	Mar. 18.
Turneps in full bloom -	— 15.	— 25.
Damsons in full bloom -	— 16.	— 20.
Cuckoo began to call -	— 17. (f)	April 16.
Oak began to leaf - -	— 18. (g)	— 20.
Blackthorn began to blow -	— 18.	Mar. 15.
Pear tree began to blow -	— 18.	— 18.
Cherry in full blow - -	— 18.	April 7.
Hawthorn began to foliate -	— 18.	Mar. 15.
Walnut 'leaves quite out' -	— 21. (h)	April 20.
Wallflower full blown -	— 21.	Mar. 28.
Ash 'leaves and flowers quite out' - -	— 22. (i)	April 25.
Furze in general bloom -	— 22.	Mar. 25.
Lilac in full bloom - -	— 27.	April 7.
Hawthorn began to blow -	— 28.	— 12.
Cowslips full blown -	May 4.	— 20.
Hawthorn in full blow -	— 10.	May 1.

17th April. Does not her early singing this year make it probable that she either is not a bird of passage, or migrates to a less distant country, than does the swallow?

(f) CUCKOO. In 1776 the cuckoo began to call, on the same day, the 17th April; and in 1779, on the 16th April! Notwithstanding 1755 is said to have been a backward, and 1779 is, undoubtedly, a very forward spring; yet, striking as this is, no inference aptly presents itself.

(g) OAK. See the following observations; this, perhaps, was taken from some few extraordinarily early individuals.

(h) WALNUT. This I apprehend is an error, either of the press or the observer, or both; for this year the leaves of the walnut, even near London (Hyde Park), were not distinct, much less 'quite out,' before the 20th. But, perhaps, this was likewise taken from some very forward individual, and the large (L) has been erroneously joined to it instead of the small (l). See page 303.

(i) ASH. Here is another instance similar to, or rather more inexplicable than the last.

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An important inference may be drawn, from this comparative Register ; namely, the progress of spring varies, in this country, upwards of a month. In some instances, in the former parts of these two springs, there is a disparity of five or six weeks ; and, it is probable, that, had it not been for the considerable check, which the vegetation of this spring received, in March-April, a similar disparity would have continued, until May ; and, if the approach of spring is so casual, as to vary a month or six weeks, we may say with some degree of safety, that the chilling winds of March-April were merely a casualty, which, at another time, may not happen. And further, perhaps, were the spring of this year, compared, with the most backward spring which has happened, in this country, a difference of six or eight weeks might appear. *

In the polar latitudes ; or,—to speak of our own hemisphere,—in the northern climates, where summers are short, vegetation

* However, in the above case, a week or ten days must be deducted, for the difference of climature, in the two places of observation. See NORFOLK, Art: CLIMATURE.

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is rapid ; in more southern latitudes, where summers are longer, vegetation is slower, in its advances towards maturity. May we infer, from this, that summers, whether in the same or in different climates, *have some certain degree of exertion, with respect to vegetation*, which certain degree is spent, during the course of *every* summer ; whether it commences in February, March, or April ; or whether its duration happens to be four, six, or eight months ? and that whatever share of this exertion is exhausted, on any given part of the summer, as the former part, for instance, so much the remaining parts will be deficient ? This admitted, it follows, that, if a vegetable, which requires the *whole exertion*, be sown, *after a part of that exertion has been expended*, such vegetable did not receive its proper time of sowing.

If this hypothesis be well founded, the foregoing inference is very interesting ; for it proves, that a farmer, who consults the *solar calendar* alone, may mistake his time of sowing, a month, or six weeks, whereby he may lose an essential share of that exer-

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tion, which, if he were to consult the progress of vegetation, and regulate his seed-time, by the *terrestrial calendar*, his crops would receive.

If this hypothesis be founded in error, why shall we attend to the foliation of trees? Why not regulate our time of sowing, by an astronomical ephemeris?

Whether this hypothesis is, or is not, well founded, can be decided, only, by a series of accurate observations, during a course of years.*

* Perhaps, by comparing a minute register of the state of the atmosphere, with a minute register of vernal vegetation, the causes of vegetation might be nearly ascertained. Thus, by a thermometer (for instance), calculate how much heat, reckoning from the winter solstice, is necessary to bring the hazel catkin to blow—how much to produce violets, &c. not the *degree* of heat, at any certain time, but the *quantity* taken collectively, reckoning from some certain point, as the freezing point.—Should the thermometer fall to, or beneath the freezing point (or perhaps, some certain point below the freezing point), we may suppose vegetation to be checked, and consequently nothing can be reckoned, until the thermometer rises, again, to above that point. The weight, moisture, motion, &c. of the atmosphere might be observed, in a similar manner.

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In making these Observations, however, great circumspection is necessary : not only in the observing, but in the registering of the appearances ; especially if the register be intended for public inspection. The want of this precaution renders Mr. Stillingfleet's Calendar, so far as it relates to the foliation of trees, very imperfect ; for he frequently describes it, by the "leaves quite out" on some certain day of the month, and registers this, only, by a single letter (L), which is too liable to typographical error, to be trusted, on a subject, so nicely accurate, as this ought to be, to render it of ordinary use.

Beside, nothing can be more indefinite, than to speak of a tree's being *quite out*, or in *full leaf*. As for instance, the buds of the narrow-leaved elm, this year, began to *burst*, about the eighteenth of March ; yet it could not be said to be in *full leaf*, until the latter end of April.

The elm, it is true, *opened* into leaf, the seventh of April ; but the opening of the leaf cannot be the period meant by Mr. Stillingfleet, for he has another character

359. TIME OF SOWING.

for "leaves beginning to open;" namely, a small (1). Nor by "leaves quite out" can Mr. S. mean the full leaf here spoken of; namely, the day on which the leaf received its fullest width, or largest size; for he makes the oak's "leaves quite out" the sixth of May; and it will not, even this year, be in that state, before the beginning of June.

If, therefore, the foliation of an individual is so difficult to communicate, how vague must be the idea, when we speak of the species? For, by accurate observation, this year, there were several oaks in the very same state of foliation, on the seventh of April, which the majority of the oaks of the same wood, and the same aspect, were, on the twentieth of April; and which many others did not reach, until the wane of the month. Thus we may say, the oak, in 1779, foliated the seventh of April, the twentieth of April, or the thirtieth of April! And if we say that the observation was made in latitude $51^{\circ} 22'$, on a stiff clayey soil, with a northern aspect, sheltered from the east, we shall not be less unintelligible.

HAVING thus endeavored to show the necessity of using great circumspection, in forming a register of vernal vegetation, I will now beg leave to submit such RULES FOR OBSERVING THE FOLIATION OF TREES, as I have drawn from the experience which I have had, this spring. And first, as to individuals.

The most striking stage of foliation is, when the *buds* have *burst*, or fully expanded themselves, and the *leaves*, though yet diminutive, appear *distinct*. For, prior to this stage, the tree, notwithstanding the swelling of the buds, *still retains its winter appearance*; but as soon as the young leaves are disclosed, the spray becomes in some measure obscured, by their verdure, and the shrub or tree becomes faintly green, puts on its vernal garment. This process of nature is begun and finished, in some individuals (especially if the weather be warm and showery) in a very few days—perhaps in one day;—and is not only apparently, but literally, the foliation, or production of the leaves. Having marked the beginning

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and the finishing of the foliation of an individual, let the mean, or medial day, be taken, and considered as the DAY OF FOLIATION of that INDIVIDUAL.

By a similar process, the foliation of the SPECIES may be nearly ascertained ; namely, by marking the beginning and the finishing of the individuals, and by taking the mean between the two extremes, and considering this as the day of foliation of the species.*

However, with respect to the UTILITY of observing the foliation of trees, whether we view it in the light of regulating the time of sowing, or of ascertaining the forwardness or backwardness of springs, or of

* This may be checked, and, if necessary, regulated, by the apparent majority which showed itself on any particular day ; as some excentric individuals begin to foliate extraordinary early, and others particularly late ; but, by taking the mean of the two means, the day of foliation may be ascertained with a great degree of accuracy.

JAN: 1799. By these rules, I have since observed, and registered, the PROGRESS OF SPRINGS, in various parts of the Island. Those taken in NORFOLK, YORKSHIRE, GLOCESTERSHIRE, and the MIDLAND COUNTIES, are published.

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pointing out the cause of vegetation, the observations should, I think, be made, every year, on the SAME INDIVIDUALS; and whether it be, by the philosopher, or the farmer, he ought to mark out a suit of individuals, (of a middle age, healthy, and in a good exposure) and consider these as the meters of vegetation, in the same manner as he considers the barometer, the thermometer, &c. as the meters of the state of the atmosphere. And let him observe and mark down the motion, or ascent of the sap, whether it show itself in the bud, the leaf, the blossom, or the fruit, with the same exactness and care, as he does that of the mercury; and, by comparing the different columns of his register, observe what state of the atmosphere promoted, and which retarded vegetation. And let the farmer, at harvest, compare the states of vegetation, at the different times of sowing, with the crops they severally produce, and thus regulate, in future, the proper time of sowing.

It has already been observed, that a farmer by profession, whose beasts of draft are duly in proportion, to the size of his farm,

359. TIME OF SOWING.

cannot attend, nicely, to the foliation of trees, with respect to his time of sowing; but if springs vary, a month or six weeks, in their degrees of forwardness, it seems reasonable, that he should not entirely overlook the progress of vernal vegetation. Nothing, however, but a series of observation can ascertain the truth of this hypothesis; for an hypothesis it must, as yet, be considered: and, it is probable, that the utmost, he can ever profit by it, will be something similar to this: namely,—to begin spring-sowing while the hazel (for instance) blows, and finish while the oak foliates.

The farmer of a few acres, indeed, may perhaps find somewhat like the following to be a useful guide: namely, to sow his peas and beans while the hazel blows,—his oats while the sallow blows,—and his barley while the hawthorn blows.

The autumnal seedtime may, perhaps, be regulated, in a similar manner, by the falling of leaves, the forming of catkins, &c.

These intimations, however, will not I hope be mistaken for precepts; but will be considered, only, as anticipating what may

359. TIME OF SOWING.

be, after many years' accurate observation, expected from the foliation of trees, with respect to the time of sowing.

JANUARY, 1799. For farther observations on this subject, see NORFOLK, sect: BARLEY, also Min: 125. See also MIDLAND COUNTIES, MIN: 82 and 90.

360.

CONCLUSION.

WHEN an employment becomes *familiar*, its ordinary operations, and the incidents which attend them, slide away, without leaving an impression on the mind. And it would, perhaps, be difficult for a man, who has been trained up, from his youth, in farming, and who has entered into practice, without having had his mind alienated from it, by long absence, to prosecute a series of Minutes, on the minutiae of management.

This reflection arises from a want of

360. CONCLUSION.

fresh information, since July 1777, relative to various heads of the general subject. Indeed, had I not fallen upon a systematic method of recording the useful incidents, which arose in the last two years' practice, the collection would have been inconsiderable. This idea is strengthened, by the preceding MINUTES, which are numerous, in the springs of 1775 and 1776, but few, in 1777.

How necessary, then, is an ANNUAL RETROSPECT ; in which the whole business of the farm is brought under view, and the more valuable incidents caught, with almost mathematical certainty ; even by one to whom the business of farming is become habitual ? and how peculiarly valuable may the practice of making MISCELLANEOUS MINUTES be rendered, to the inexperienced ?

I will further suggest, that every man, who will, while the business of farming is a *new*, and consequently a *striking*, subject to him, *minute*, and *communicate*, the more interesting incidents, which present themselves, in the EXECUTIVE PART OF MA-

360. CONCLUSION.

NAGEMENT,—giving his reasons, for adopting, or rejecting, peculiar points of practice,—will be rendering an acceptable service, to this difficult, yet important, department of the profession.

JANUARY, 1799. Before I close this account of my PRACTICE, in the SOUTHERN DEPARTMENT, it may be useful to my readers, as well as gratifying to myself, to say, that, by five years' practice, conducted in the manner, here detailed, and with the scientific assistance, here set forth, I acquired so competent a knowledge of the profession, that, in a Survey of the practice of the kingdom, at large, I have learnt very little, which could have been useful to me, in the situation, and under the given circumstances of the farm lands, which were, here, the subject of my practice.

Indeed, with respect to CULTIVATION, of lands in general, the additional knowledge I have obtained is comparatively small: and, with respect to the culture of STRONG SOILS, lying on RETENTIVE BASES, I have found nothing, in the established practice,

360. CONCLUSION.

of any part of the kingdom, so eligible as that, which I here struck out, and which I recommend, with confidence, to every cultivator, of lands of that description.

Nevertheless, on the cultivation of LIGHT LANDS, in remote situations, and of STRONG LANDS, ON ABSORBENT BASES, as well as on the management of PARTICULAR ARTICLES of PRODUCE, I have accumulated much valuable information.

And, on the different species of LIVESTOCK, their various breeds, and the particulars of their management,—also, on the subject of WOODLANDS, and the management of LANDED ESTATES,—the information obtained, in the different departments, far exceeds every expectation I formed, at the time I drew out—and held up for patronage!—the

PLAN FOR PROMOTING AGRICULTURE.

For which, see the Advertisement prefixed to the RURAL ECONOMY of NORFOLK. And, for the other Volumes, published in consequence of it, see the close of the first of the present Volumes.

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DIGEST,
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SYSTEMATIC INDEX,
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MISCELLANEOUS MATTER
OF
THE TWO VOLUMES.

THE USES of a reference of this nature, to the miscellaneous materials of these Volumes, are evident: particular parts may thereby be readily found; and the distinct subjects be read, separately, with the same advantage, as if the subjects themselves were organically arranged.

The deviations, in this case, from the arrangement observed, in the DIGEST of the MINUTES of AGRICULTURE, have arisen from an increasing knowledge of the general subject. Indeed, I have, in every

case, avoided *fixing* a SYNTHETIC ARRANGEMENT. On the contrary, I have, in each of the PROVINCIAL REGISTERS, had a view to improvement, and have been voluntarily led, by the circumstances of the case before me; in order that, in a GENERAL WORK, I may be the better enabled, to reach a maturity of arrangement, even in the minor branches of the science. The groundwork, and the general principle, remain, in every case, the same.

I.

MANAGEMENT

OF

ESTATES.

UNDER this head, I collect the few particulars which relate to the GENERAL MANAGEMENT, RENT, &c. as well as those ON FENCES, ROADS, and BUILDINGS; agreeably to the plan of the PROVINCIAL REGISTERS.

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MINUTES.

- 40. An instance of watering a young hedge.
- 46. On the impropriety of paying hedgers, in kind.
- 209. A granary should be placed under the eye.
- 234. Instance of disadvantage of tall hedges, to arable fields.
- 253. A plan of treatment of old hedges adopted.

GENERAL REMARKS, 1777.

- 279. On homesteads; with practical inferences, drawn from experience.*
- 287. Hints on forming and repairing roads, with the plow.
- 288. Instance of success in raising a hedge; and the method described.
- 295. On the evils of excessive rents.
- 300. That subject more fully investigated.

EXPERIMENT.

- 320. On the method of plashing hedges.

GENERAL REMARKS, 1779.

- 357. Further on plashing hedges.
- . Generally, on farm fences.

* For a DESCRIPTION of the FARMERY, the site of this experience, see VOL. I. p. 65. Also PLATE I.

2.

A G R I C U L T U R E.

GENERAL REMARKS, 1777.

277. The importance of agriculture, in the present state of SOCIETY, considered.
 —. Its rank, as a PROFESSION ; and the various motives towards it.
 294. The ASSISTANT SCIENCES of agriculture enumerated.

3.

F A R M S.

MINUTES.

55. A disadvantage of a scattered farm instanced.
 72. Another instance of the same.
 161. A further proof of the ineligibility of a made up farm.
 165. Thoughts on the characteristics of farms, as to soils.

GENERAL REMARK, 1777.

278. The sizes of farms considered, in different lights.

4.

S O I L S.

MINUTES.

55. A disadvantage of strong tenacious soils evinced.
154. A further instance of the disadvantage attending wet lands.
175. A tenacious soil described.
216. A bad property of gravelly soils.

GENERAL REMARK, 1777.

280. The more evident properties of soils viewed, analytically; and general inferences drawn.

OBSERVATIONS.

338. Every species productive of wheat.
- Gravelly soils hazardous to a farmer.
339. Strong loams are affected by clover.

5.

M A N U R E S.

MINUTES.

11. On forming compost, in fallow ground.
20. On fern, as a material of manure.

- 64. On the proper method of forming compost.
- 80. On the eligibility of herbaceous manure.
- 87. On the unvolatility of vegetable food.
- 104. On the nature of soot, as a surface manure.
- 141. On stubble, as a material of manure.
- 152. Calculations on the exhaustion of manure, by crops.
- 170. On the best form of a dung pile.
- 231. Evidence of the use of herbaceous manure.
- 233. A further evidence of the unvolatility of manure.
- . General Remarks, on the melioration of arable lands.
- 249. The effect of soot, on retentive soil.
- 259. Experiments, with soot, wood ashes, and lime.

GENERAL REMARK, 1777.

- 281. Manure is as money to the farmer.

EXPERIMENTS.

- 318. On composts of mud and mold.
- 324. On yard liquor, as a manure.

OBSERVATIONS.

- 349. A method of communicating the *quantity* adopted, ii. 187.

351. On the effects of exposure and herbageous melioration.

GENERAL REMARKS, 1778.

352. The general subject touched on.
— Further on the quantity of dung.

6.

S E E D S.

MINUTES.

109. Trials, with blighted wheat, as seed.
146. An experiment on the change of seed.
239. Further on blighted seed.

EXPERIMENTS.

304. On changing the seed of wheat.
312. On the same.

7.

THE WEATHER.

THIS subject being treated of, in detail, in SECTION 353, and the MINUTES, and other miscellaneous REMARKS, being referred to, from thence, it is unnecessary, in this place, to repeat the references.

But a GENERAL REMARK, in 1777, being there omitted to be referred to, is proper to be here noticed. See SECTION 283.

8. .

FARMERS,
AND
MANAGERS.

MINUTES.

- 72. The amusement of farming rests much on soil and situation.
- 97. A proper bailif, or farm manager, is difficult to procure.
- 134. The requisites of a foreman, or bustler, enumerated.

GENERAL REMARKS, 1777.

- 300. A specification of a farmer's fortune. N.
- The requisite qualifications of a farmer.
- Instance of a considerable fortune being made, by a farmer; and through what means.

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9.

WORKPEOPLE.

MINUTES.

46. On the custom of giving hedgers wood, instead of wages.
47. A lesson to careless carters.
62. An expert docile servant is worthy of reward.
69. Day laborers require looking after.
90. It is dangerous to give farm laborers more than they *expect*:
91. Or to raise them above their fellow laborers.
115. There are few workmen fit for gardenly agriculture.
128. On changing yearly servants at Michaelmas.
131. Further on the folly of this custom.
145. The cost of farm beer calculated.
 - On allowing laborers beer.
191. On the thievishness of horse carters.
209. Further, on the same.
214. The annual expence of indoor servants calculated.

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VOL. 1

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214. The annual expence of indoor servants calculated.

- 215. Facts and reflections on employing parishioners.
- 237. On bribing workmen with liquor.
- 244. Their proper arrangement, in harvest.
- 260. A good plowman is a most valuable servant.

GENERAL REMARKS, 1777.

- 284. The subject of ingratitude discussed; with a practical inference suggested.

10.

BEASTS OF DRAFT.

MINUTES.

- 3. A team of oxen prematurely purchased; with remarks on the circumstance.
- 5. On giving farm horses oats in chaff.
- 25. On the effect of *finery*, in introducing oxen.
- On the nose ring, and its beneficial effect.
- 28. On the form and qualifications of working cattle.

34. Further, on the advantage of nose rings.
42. Cast off coach horses, and strong hacks, are adapted to whip-rein plows.
76. Wooden ox collars proved.
89. On the green forages, proper for oxen.
93. Oxen found tractable in a cart.
95. Instance of an ox standing hard work.
96. On wooden horse collars.
98. The use of the leading crook proved.
106. An ox sufflated, on stale clover ; with reflections on the fact.
119. An advantage of plowing with oxen, in harvest.
138. An advantage of oxen, on deep land.
 - The walk of the ox, and of the horse, examined.
140. Oxen tractable, at harrow.
 - Further advantages of oxen.
151. Oxen and horses compared, at plow.
153. Their comparative expence calculated.
 - Began to allowance horses, with hay.
156. Wet roads injure the feet of oxen.
 - An easy method of shoeing their forefeet.
162. The expence of working oxen, in the winter months, calculated.

- 163. Shod the oxen's hind feet.
- 167. An ox died, in a state of sufflation.
- 169. Oxen, at dung cart; with hints on training them.
- 171. Further, on their versatility.
- 174. Different methods of feeding cart horses noticed; and a middle way adopted.
- 177. Further proofs of the versatility of oxen.
- 184. On the hours of work, of oxen.
 - On the breeds of farm horses.
- 190. Experiment, with oxen and horses, on hay alone.
- 191. Instance of the wastefulness of horse carters.
- 207. On bulls, as beasts of draft.
- 210. The cost of artificial chaff calculated.
- 258. An aged ox afforded beef of the first quality.
- 262. A comparative view of aged horses and oxen.
- 266. Oxen worked well on tare-barley fodder.
 - Instance of the superior value of aged oxen, in standing hard work.
- 271. Cabbages found to be a valuable food of working oxen, in spring seedtime.

GENERAL REMARKS, 1777.

285. Brood mares estimated, as beasts of draft.
- Oxen and horses compared, at large.
 - Mules noticed, N.
 - The decline of oxen endeavored to be explained.
 - A plan of management for their re-establishment suggested.
 - A tax, on horses, proposed.

OBSERVATION.

342. Tare-barley fodder eligible, as a food of oxen.

GENERAL REMARKS, 1778.

354. An opinion, respecting oxen, as beasts of draft.
- A method of shoeing them, by slinging, proposed.

11.

I M P L E M E N T S.

MINUTES.

22. Two light Yorkshire plows procured.
29. The utility of concave harrows first occurred.

- 30. The lance contrived, and described.
- 35. A pair of concave harrows proved.
- 37. A pair of light ones also tried and adopted.
- 38. A strong evidence, that the plow, and the plow team, should be varied with the soil.
- 39. Further on this subject.
- 45. A pair of flat, handled harrows tried.
- . Remarks on generalizing ideas, in matters of invention.
- 48. The pulse drill, and its pretensions, noticed.
- 49. A horse broom invented.
- 50. The advantage of light whip-rein plows calculated.
- 51. The straight horse broom described, with remarks on bush harrows.
- 52. The land plane ; its origin and use.
- 53. A carrot groove formed.
- 56. The barley flute contrived.
- 61. The sowing cart completed.
- 62. The double hand hoe ; and the proper method of using it.
- 76. Wooden ox collars proved.
- 78. On the double-mold-board plow.
- 83. On the proper situation of the coulter.

93. T
 98. T
 130. C
 140. T
 147. C
 148. T
 158. T
 160. A
 175. F
 180. T
 182. T
 183. M
 —. T
 192. C
 205. F
 251. O

93. The new cart proved.
98. The use of the ox crook shown.
130. General remarks on subplows.
140. The valuable effects of round harrows seen.
147. On the want of a skim plow, for round ridges.
148. The bean groove progressively constructed.
158. The further progress of this implement.
160. A saw horse contrived, and described.
175. Further on the bean groove.
180. The defects of the common plow of this country enumerated.
182. The performance of the bean groove.
183. Much depends on the construction of the plow.
 - The use of the cresting iron shown.
192. On the plain and spikey rollers, on fallows.
205. Further on the spikey roller ; with an improved method of setting the spikes.
251. On the width of the stern of the plow.

GENERAL REMARKS, 1777.

286. New implements described.

Concave harrows, ii. 32.

Double hand-hoe, ii. 33.

Pulse drill, ii. 33.

Sowing cart, ii. 35.

Land plane, ii. 35.

Ox collars, ii. 39.

Ox crook, ii. 39.

Skim plow, ii. 40.

Coulter band, ii. 42.

Flutes, ii. 43.

Bean groove, ii. 45.

Saw horse, ii. 45.

New cart, ii. 45.

GENERAL REMARKS, 1778.

355. New implements recommended.

12.

GENERAL MANAGEMENT

OF

FARM LANDS.

THIS Department of the RURAL SCIENCE
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to define, and incorporate with the GENERAL SYSTEM.

In an elementary work on the subject, the rise and progress of the art,—the adaption of given lands to their proper uses,—the laying out (if open) or classing them (if inclosed),—and the general economy, or course of practice to be pursued, in obtaining the desired objects,—would require to be explained, under this head: under which the general principles of the art, already established, as well as the general principles of improvement, would aptly fall.

This general head is connected with the ordinary operations of agriculture, as these are with the individual crops to which they are applied; or, to speak in better defined terms, as class is with order, and genus with species: a mode of arrangement, as *natural*, and as *essentially necessary*, in systematising the objects and operations of a complex art, as it is, in reducing to system the individual objects and properties of nature.

MINUTES.

1. Began to farm from my own experience.

3. Any thing *new* ought to be introduced, with caution. 232.
41. An evidence of the influence of established customs, on practice. 245.
55. The disadvantages of small fields, and crooked hedges, fully shown. 248.
59. The course of practice should be regulated, by circumstances. 250.
94. Another evidence of this principle.
97. Can a farm be managed with the pen? 259.
125. A further instance of being guided, by circumstances. 269.
134. Some general principles, in the executive department, touched upon. 272.
136. Instance of the impropriety of fallowing, for a winter crop. 273.
154. Further evidence, on this point.
165. The general principles of laying out farm lands applied, in practice. 292.
184. Exertion may be over stretched.
188. A sketch of my general plan.
193. Further, on the general economy.
217. On mowing weeds, in June, as a general principle of management.
223. A further instance of consulting, and being guided by, existing circumstances. 307.

GENERAL MANAGEMENT. 331

232. On the advantage of tare herbage, as a fallow crop, for spring corn and clover.
245. On the succession of barley, clover, wheat.
248. Instance of the disadvantages of backward, scattered, small plots of grain.
250. A further instance of the force of custom.
259. General remarks, on experimental agriculture ; and a method adopted.
269. Three years daily attention completed.
272. Further evidence of the propriety of cleaning the soil, for spring corn and ley herbage.
273. A month's absence from the farm ; and its effects.

GENERAL REMARK, 1777.

292. Thoughts on a regular rotation of crops.

INTRODUCTORY

Remarks on EXPERIMENTAL AGRICULTURE, ii. 85.

EXPERIMENT.

307. On the proper succession of wheat.

INTRODUCTORY

Remarks, ON ANNUAL RETROSPECTS.
OBSERVATIONS.

337. On forming arrangements of crops.
— The arrangement of the crop, 1777.
338. On the general practices of fallowing,
for wheat, and for spring corn, &c.
ii. 148.
— Further remarks, on annual retros-
pects, ii. 153.
343. The eligibility of fallowing for spring
corn, and ley herbage, further in-
stanced.
— An eight years' round struck out.
344. The arrangement, 1778.
349. Instance of three crops of wheat, in
four years.
350. Further, on cleaning land, for spring
corn and clover.
351. Annual retrospects extendible to live-
stock.

GENERAL REMARKS, 1779.

356. Classing farm lands recommended.
— The advantages of a garden field
shown.
358. A regular succession, or rotation of
crops, considered.

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13.

CULTIVATION
OF
ARABLE LANDS:
OR,

OPERATIONS belonging to the SOIL.

THIS, the most laborious part of agriculture, receives the soil at the hands of nature, and fits it for the reception of the seed.

Its first work is DRAINING, or freeing the soil and substrata, from superfluous moisture. The next is CLEARING the surface soil from obstructions; whether of a fossil or vegetable nature; and LEVELLING it, sufficiently, for the operation of the plow. The last is TILLAGE; which, at once, frees it from weeds and vermin, and exposes it to the action of the atmosphere; and, at the same time, breaks it, and renders it porous, to receive the seeds, and give freedom of pasturage to the tender rootlings of the infant plants; and, finally, deposits it, in such a

manner, as is most conducive to their growth, on the given soil under cultivation.

MINUTES.

12. Instance of the good effect of tillage, continued through the summer.
32. An expedient, on breaking up flat, wet land.
38. The plow and the plow team should be suitable to the soil.
39. Further evidence, on this point.
50. Calculation of the profitable advantage of plowing with whip reins.
58. A hint, on rolling narrow ridges.
60. The origin, and valuable effects, of plowing, *land for land*.
- . Nomenclature of the principal terms of tillage.
- . General remarks on fallowing.
66. The effect of plowing fallows, very wet ; with remarks.
67. A method of gathering up the soil, into waves, for grass land.
73. Remarks on the Midsummer fallow.
80. On checking a fallow, by meliorating herbage.
92. On the proper direction of arable ridges.

105. The utility of subplowing instanced.
111. A simple expedient, in plowing in tall herbage, practised.
114. A valuable effect of deep plowing ; with reflections.
123. A method of doubling high halfrod ridges practised.
133. A further instance of subplowing ; its cheapness, and utility.
135. A sketch of the gradations of plowmanship.
139. A strong evidence, in favor of surface drains, on retentive lands.
 - An observable point, in cross-plowing flat lands.
148. Round ridges require plits of unequal dimensions.
154. A slight frost prevents fine harrowing.
157. The method of reversing round half-rod ridges detailed.
 - General remarks, on arable ridges.
158. The practice of balking, or half-plowing, struck out ; with remarks.
175. Reflections on fallows, and fallow crops.
185. Remarks on the width, and roundness of ridges, for winter crops.

192. On the use of the plain roller, in the operations of tillage.
196. An evidence of tillage being destructive of the sodworm.
197. An evident advantage of halfrod ridges, in a wet spring.
212. The propriety of breaking up fallows, by balking, evidenced.
213. Halfrod beds are most conveniently weeded.
223. Deep plowing produced seed weeds.
— Reflections on deep tillage.
— A method of deepening the cultivated mold practised, with success.
231. Strong evidence of tillage being highly favorable to wheat.
233. Further evidences of the same effect.
— The proper use of subplowing traced out.
235. Perhaps, narrow ridges prevent corn from lodging.
251. Practical remarks on forming and reversing halfrod ridges.
255. An evidence, that summer tillage is necessary to the destruction of couch.
260. An instance of the value of accurate plowing.

274. A

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338. A

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VOL.

274. A decisive experiment, on crossing a balked fallow.

GENERAL REMARK, 1777.

289. Instance of the good effect of a deep shore ditch.

EXPERIMENTS.

305. On summer fallowing, and fallow crops.
308. On the quantity of tillage.
310. On depositing gravelly loam.
321. On clearing the surface, before plowing.
336. On the proper time of crossing a balked fallow.

OBSERVATIONS.

338. A theory of depositing porous soils suggested, ii. 135.
— A winter and spring fallow not to be depended on, ii. 148.
348. The use of skim-plowing, for peas.
349. On skim-plowing clover ley, for wheat.
— Further on the same, ii. 192.
350. A striking effect of summer fallowing, ii. 196.
351. The first instance of balking loose ground ; and the probable effect.

14.

MELIORATION
OF
ARABLE LANDS;
OR,

OPERATIONS belonging to MANURE.

MELIORATION is another subject of Agriculture, which is difficult to reduce to SCIENCE; being more or less connected, with every stage of the arable process.

Meliorations are separable, into MANURES, and STIMULANTS.* The former may be brought upon the land, as an addition to the soil; or it may be produced, by the soil itself, as in the case of herbaceous Melioration.† It remains, however, to be proved, whether vegetation, in this case, does not act, principally, as a stimulant. It doubtless operates, in some degree, as such. And tillage is a still more powerful stimu-

* See the head, MANURES, foregoing.

† See MIN: 233.

lant. As to calcareous earth, I am of opinion, that, like succulent herbage buried in the soil, it acts in the twofold capacity, of manure, and stimulant. And, in regard to the effects of combustion, on the soil and the vegetable matter it contains, I believe, they are, also, of a complex nature.

JANUARY, 1799. These intimations are studiously conveyed, in the most cautious manner. I have hitherto endeavored to guard against imbibing general ideas, respecting this difficult, but most important, point of human science.

At present, we have barely firm ground enough to stand upon ; and none on which to delineate the THEORY OF MELIORATION. Nor is there any hope of forming such a basis, without the requisite accommodations of a

PUBLIC INSTITUTION.

The attempts which have been made sufficiently show, that little *practical knowledge* of this subject is to be expected, from *abstract chemistry*:—from CHEMISTRY unconnected with PRACTICAL AGRICULTURE.

MINUTES.

- 11. An instance of forming compost, with the soil of fallow ground.
- 20. Raking off the undigested parts of long dung, laid on ley ground, practised.
- 21. Further, on this practice.
- 23. On the operation of sowing soot.
- 54. Further, on the same.
- 61. The expence of sowing it.
- 64. Practical remarks, on mixing compost.
- 104. On the season of sowing soot.
- 170. The form of a dung pile determined.
- 233. Remark on incorporating manure with the soil, &c. &c.
- 259. Experiments on manuring the surface of arable lands, at seedtime.

GENERAL REMARKS, 1777.

- 282. The theory of manuring attempted, as it relates to absorbent and retentive soils.

—. Practical inference drawn.

EXPERIMENTS.

- 314. On manuring the surface of retentive soils, in winter.
- 315 to 319. On the same.
- 324. On the application of yard liquor.

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15.

SEMINATION

OF

ARABLE CROPS;

OR,

OPERATIONS belonging to the SEED.

THIS stage of the arable process receives the prepared soil, after the seminal (or last) plowing; furnishes it with the means of vegetation; and, having placed it in the state, most profitable to the growth of the given crop, leaves it to the elements; or consigns it over, to the operations belonging to the stage of VEGETATION.

The subject of SEMINATION aptly separates into

- The season of sowing,
- The preparation of the seed,
- The mode of sowing,
- The quantity of seed,
- Covering the seed,
- Adjusting the surface.

MINUTES.

9. Endeavor to sow before, rather than behind, the season.
57. An experiment, on preparing the seed of barley.
59. Remarks on the proper time of sowing barley.
82. A striking incident, on the quantity of seed barley.
100. An experiment, on covering wheat, with the plow, and with the harrow.
115. General remarks, on adjusting the surface, by semiculture.
121. An inconveniency of late-sown crops instanced.
127. Advantages of sowing the fresh-plowed surface enumerated.
137. General remarks, on opening interfurrows.
139. General remarks, on the use of crossfurrows.
149. The expence of crossfurrowing calculated.
175. A disadvantage of drilling instanced.
181. On the impropriety of *forcing* a season.
187. The advantage of bedding the seed, in fine mold, evidenced.

189.

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189. An experiment, on sowing a rough, and a broken, surface.
192. The use of the roller, in bedding the seed, instanced.
196. Further, on the use of pulverizing the surface mold, after the seed is sown.
200. Further, on adjusting the surface, by hand.
205. An extraordinary spring seedtime noticed.
- Instance of spikey-rolling, after sowing.
219. A disadvantage, as well as advantages, of early sowing, instanced.
220. The expence of covering small seeds, by hand ; with remarks.
250. Practical remarks, on the business of sowing, broadcast ; and a new practice adopted.
- 252 A new method of sowing halfrod ridges struck out,
260. A hint, on harrowing seed into unbroken plits,
272. Further, on the utility of rolling, as an assistant operation, in covering the seed.

EXPERIMENTS.

309. On fluting the fresh and the stale plit.
322 and 3. On breaking the plits, before sowing.

OBSERVATIONS.

338. General rules, for the time of sowing, suggested.
— On the quantity of seed, for gravelly soils.

GENERAL REMARKS, 1779.

359. The time of sowing considered, at large.
— A comparative view of the springs, 1755, and 1779.
— Inferences and reflections resulting from it.
— Rules for observing the foliation of trees.
— Guides to the time of sowing suggested.

16.

VEGETATION

OF

ARABLE CROPS;

OR

OPERATIONS during their GROWTH.

THESE operations belong more particularly, to FALLOW CROPS,—raised in rows,—with wide intervals; as beans and peas are raised, in the Kentish husbandry. SEE DISTRICT OF MAIDSTONE, and ISLE OF THANET, in the SOUTHERN COUNTIES.

But they are more or less applicable, to every crop—which stands thin upon the ground; whether in rows, or at random. See MINUTE 68.

In a more general view, this stage of the arable management takes charge of the GROWING CROP, from the time it appears, to that of its maturity; or the state of maturation, suitable to its intended purpose. It relieves the roots from superfluous moisture (if this has not been fully guarded against in

the preceding stage), and guards, as much as the use of implements can guard, against the effects of drought : it can assist the crop with manures, and defend it, as far as human industry can, from weeds, vermin, and obstructions. Even the crop, itself, is under the controul of this department : it may be thinned, or be checked in its growth, either by the sithe or pasturage ; or may, when attendant circumstances require it, be cut off, prematurely ; or be buried in the soil, for the purpose of melioration.

MINUTES.

- 58. A hint on rolling narrow ridges.
- 63. Remarks, on cultivating the interfurrows of corn ridges.
- 68. Instance of hand-hoing random wheat ; with remarks.
- 77. An evidence that blights are incident to the plants affected.
- 113. Incidental remarks, on harrowing winter crops, in the spring.
- 211. An improved method of clearing new leys, from stones, suggested.
- 213. General remarks on the business of handweeding.

- 219. On the destructiveness of sparrows, and on their extirpation.
- 235. Further, on hoing interfurrows.
- 267. A further improvement in the business of stone-picking.

EXPERIMENTS.

- 325. On checking a rank crop, with the sithe.
- 327. On mowing off, and plowing under, a foul crop.
- 328. On the same.

OBSERVATIONS.

- 338. Further, on checking winter crops, in the spring, ii. 145.
- 341. On harrowing winter crops, in the spring.

17.

PRESERVATION

OF

A R A B L E C R O P S ;

OR

OPERATIONS belonging to HARVEST.

THIS stage receives the ripened crop, on the ground ; cuts and cures it ; and lays

it up securely, in the barn or stack yard:
or delivers it over to the flail, in the field.
See YORKSHIRE, on thrashing RAPE and
OATS.

MINUTES.

- 6. Bustle in the morning, and defy the
little difficulties of the day.
- 19. An evidence of the bad effect of barn-
ing corn, while it is damp.
- 24. Experiment, on chopping, and raking,
stubbles.
- 31. A caution, respecting stack frames.
- 99. An experiment, on mowing wheat.
- 102. Further, on this operation.
- 117. An untoward circumstance of the wea-
ther instanced.
- 120. Instance of making straw hay.
- 122. On turning corn swaths.
- 141. A general remark on collecting stub-
ble.
- 155. Experience, in forming straw hay.
- 234. Instances of high hedges being inju-
rious, in harvest.
- 237. On stimulating harvest men, with li-
quor.
- 241. Instance of carrying loose corn, be-
fore raking; with remarks.

242. An essay on the art of stackmaking.
244. The general economy of harvest considered ; and a plan made out.
— Note on the harvest month of Surrey.
— On the ordering of workwomen, in harvest.
— A requisite caution, in the work of carriage, in harvest.
248. A horse is useful, in barning loose corn.

EXPERIMENTS.

321. On collecting stubble.
334. On cocking loose corn, before carrying.

18.

HOMESTEAD
MANAGEMENT ;

OR

OPERATIONS belonging to the
FARMERY.

THIS is another, and the last, anomalous subject of the science. It more or less connects its three principal branches : namely,

The arable management,
The grassland management, and
The management of livestock.

It attends to the MANUFACTURE, and CONSUMPTION, of harvested produce ; and to the support of DOMESTIC ANIMALS, in the winter season ; as well as to the production of HOMESTALL MANURE.

MINUTES.

- 13. A general barn economy proposed.
- 15. A hint, respecting dung yards.
- 16. An instance of dishonest thrashing.
- 27. A hint, on littering farm yards.
- 41. A notice respecting winnowing mills.
- 101. On the necessity of destroying rats ;
with a remarkable instance respecting them.
- 116. Further on littering farm yards.
- 120. Instance of mixing straw, with under-made hay.
- 150. Padlocks and keys numbered and listed.
- 155. Instance of the good effect of thrashing mouldy hay.
- 166. Straw yards should be well littered, in wet weather.
- 168. This point confirmed.

- 168. General remarks on the consumption of straw.
- 191. Binding hay, for home consumption, adopted ; with reasons for the practice.
- 209. A granary should be conspicuously situated.
- 221. An eligible method of housing a corn stack, in showery weather, practised.
- 256. An incident of the proportion of dung to straw.
- 261. Further notice of the same subject.
— Calculation of the value of fodder straw.
- 264. The proportion of straw, to straw-yard stock, calculated.

EXPERIMENT.

- 324. On the means of applying yard liquor.

19.

MARKET
MANAGEMENT;
OR
THE OPERATIONS of SALE and
DELIVERY.

THIS distinct part of the general subject involves a variety of considerations; recognizing every thing, which is TAKEN OFF THE FARM: no matter as to the place of sale, or the mode of delivery.

The foregoing remarks contain few particulars, relating to this subject: the corn, in the practice which gave rise to them, being sold, by sample, and delivered in the neighborhood,—the hay, by the London load, and either carried to the London markets,* or delivered to individuals, in the country.†

* See Vol. I. p. 43.

† For ample remarks on MARKET MANAGEMENT, see NORFOLK, GLOCESTERSHIRE, MIDLAND COUNTIES, &c.

MINUTES.

209. Remarks on laying up corn, for a rising market.
268. Incidental observations, on the season of selling hay.
276. On the circumstances which regulate the prices of corn and hay.

20.

ACCOUNTS.

THIS final operation, of practical agriculture, has been noticed, and the Writer's method of keeping farm accounts sketched, in SECTION 301.

Without the assistance of accounts, the profession must remain empirical. In a pecuniary employment, accounts are the test of every plan and operation. The manufacturer employs them; not only to calculate his annual profits; but in every branch and article of his business.

Agriculture is a manufacture, of a most complicate nature: and calculations, respecting it, require to be made with peculiar

caution: *partial* calculations, unless in the more detached branches, are seldom made with sufficient accuracy. Not only the neat proceeds of the crop produced, but the STATE OF THE SOIL, both as to MANURE and CULTIVATION, before it was sown, and after it was reaped, require to be taken into the account: otherwise, it is, at best, an ingenious arrangement of figures, which may favor the views of the calculator; but cannot promote the general good of the science, or direct the individual into the right line of management.

It is by a GENERAL CALCULATION,—an ANNUAL ACCOUNT,—in which every contingent expence, and interest of capital, are equitably divided among the several articles of produce, as well as their respective proportions of the materials worked up, of the manure and state of cultivation expended, on each,—that the art is to be advanced, and the individual benefited.

MINUTES.

55. A specimen of the field account.
 152. The method of calculating the exhaustion of crops, as to manure.

GENERAL REMARKS, 1777.

301. A plan of farm accounts delineated.
— The form of a diary, or farm journal.

21.

W H E A T.

MINUTES.

4. An evidence, that blighted wheat should have some rain, in the shuck.
16. An instance of dishonest thrashing.
19. An evidence of the bad effect of housing wheat, before it be thoroughly dry.
63. An instance of plowing the interfurrows of wheat on halfrod ridges; with reasons for the practice.
68. Instance of hand-hoing thin wheat; with remarks.
71. An evidence, that a dry spring is favorable to the wheat crop.
87. An instance of a fine crop of wheat, after clover; with reflections.
99. An experiment, on mowing wheat.
100. Experiment, on sowing, before, and after, plowing.

102. The result of mowing wheat ; with a practical inference.
109. Experiments, with thin, blighted seed.
113. A bad effect of harrowing wheat, in the spring, noticed.
132. The quality of the grain depends, much, on the season.
136. A disadvantage of fallowing, for wheat, noticed ; and the advantages of clover, wheat, shown.
141. The expence of collecting wheat stubble ; with a remark on the practice.
144. Practical remarks, on sowing, during rain.
146. Experiment, on a change of seed.
154. Further instances of the disadvantage of sowing wheat on fallow ground.
173. A notice of the effect of severe frost, on the wheat crop.
187. Evidence of the utility of much harrowing, at seedtime.
- . A favorable incident, in fluting.
216. The utility of sowing wheat, early, on gravel, evidenced.
228. An experiment on brining the seed ; with remarks.

231. A retrospective view of the wheat crop,
1776.
233. The good effects of harrowing, and
fluting, further evidenced.
235. Further, on horse-hoing interfurrows.
236. Experience, in drying wet wheat.
— On the size of sheaves ; and reaping,
by the shuck.
239. Further, on sowing thin-bodied wheat.
249. Instance of soot being useless to wheat,
on clay.
259. Experiments, on top dressings, for this
crop.
260. Incidents, on harrowing wheat, into
clover ley.

GENERAL REMARK, 1777.

293. On the soils proper for wheat.

EXPERIMENTS.

303. On brining the seed.
304. On changing the seed.
306. On sowing over and under the soil.
307. On its proper succession.
309. On fluting clover ley, for wheat.
311. On the proper quantity of seed, on
gravel.
312. On changing the seed.
325. On checking a rank crop.

OBSERVATIONS.

338. Retrospective view of the crop, 1777.
 349. ————— of ———, 1778.

22.

B A R L E Y.

MINUTES.

57. An experiment, on steeping the seed.
 79. Instance of the aukward effect of a dry season, on this crop.
 —. An experiment, on checking the forward plants.
 82. Notices respecting the quantity of seed, on gravel.
 122. On turning barley in swath.
 125. An expedient, on making barley herbage into hay.
 173. An experiment, on sowing barley, in autumn; with the effect of severe frost, on the crop.
 208. The state of the autumn-sown crop, in May.
 216. An evidence, that barley should be sown early, on gravel.

- 224. The result of sowing barley, in autumn ; with remarks.
- 238. On the state of ripeness, proper for harvesting.
- 245. Further, on this point of management.

EXPERIMENT.

- 313. On sowing barley, in autumn.

OBSERVATIONS.

- 341. Retrospective view of the crop, 1777.
- 351. ————— 1778.

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175. Their rank, as a fallow crop, considered.
193. Further remarks on them, in this light.
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271. Observations on the species of cabbages.
- . An eligible forage of working cattle, in spring seedtime.

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CULTIVATED HERBAGE.

THIS, being the connecting link, between annual crops and perennial herbage, is the most indefinite, and indistinct, production of agriculture; and the most difficult, of any individual crop, to be molded to the simple form of science.

CULTIVATED HERBAGE may be *annual*, as clover, wheat; according to the ordinary practice of most parts of the kingdom; or *biennial*, as clover, raygrass, wheat; according to the NORFOLK practice; or *hexennial*, as clover, ley herbage pastured, five or six years; agreeably to the practice of the MIDLAND COUNTIES; and the WEST OF ENGLAND; or *perennial*, as when arable land is laid down to permanent meadow, or pasturage: when it, of course, falls under the denomination of GRASSLAND.

The difficulty, in respect to scientific arrangement, is to determine, with precision, on when it passes, from the state of arable, to that of grass, land.

In the two first cases, it is merely an arable crop; the second year's ley of Norfolk being usually broken up, after the spring feedage is eaten off, as a summer fallow, for wheat.

In the third case, a difference of opinion may arise. After the first year's clover crop is off, it becomes, in effect, GRASS LAND; being constantly pastured, as any other upland grass, that has never been under the plow; and is, in practice, considered as such.

In the last case, and under accurate management, the young herbage may well be considered as giving the ground the characteristic of grassland, from the time the corn crop is removed (or if it be sown without corn, from the time it appears above ground), as it certainly ought, in this case, to be pastured, from its earliest infancy; until it is firmly established in the soil.

The BUSINESS OF LEYING clearly belongs to the arable management.

On these premises, the materials, of this and the following section, are arranged.

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14. A strong evidence, that retentive lands should not be leyed flat.
32. Another instance of the same effect.
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- Observation, on the nature of white clover.
- A leading principle, in the business of leying, suggested.
81. Making clover hay, in cocklets, practised.
84. The result of this practice.
86. Further, on this point of management.
87. An evidence of clover ley being an eligible matrix, for wheat.
88. The propriety of making clover hay, in cocklets, fully ascertained.
106. Instance of an ox being sufflated, on clover.
120. ——— of mixing straw with clover hay.
136. The advantages of clover, wheat, enumerated.
155. A necessary caution, in making straw hay.
167. A partial muzzle, for cattle on clover, suggested.

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67. Instance of practice, in leying.
— On the nature of white clover.
70. Practice, in mowing weedy borders of meadows.
71. Instance of hay *yielding* well, in a dry year.

* For an analysis of the GRASSLAND MANAGEMENT,
see YORKSHIRE, Section NATURAL HERBAGE.

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333. On the same.
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347. —————, 1778.
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- 106. An ox died sufflated, by clover.
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- 167. An ox died in a state of sufflation, on dry food.
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- 273. Two cows and two pigs died.
- 275. Further instance of injury, by wet weather.
- 276. Additional proofs of the same.

* See MINUTE 129, and REMARK 295.

[GENERAL REMARK, 1777.

295. An apology for publishing on this subject.

JANUARY, 1799. In the first edition of the Minutes, I published numerous other instances of loss,—by the weather, ordinary accidents, and the carelessness of servants,—which are suppressed, in this; as they only tend to prove what is notoriously known: RISK being as inseparably incident to agriculture, as to commerce. Yet it cannot, in farming, as in trade, be *insured*.

36.

FARRIERY.

TO this ASSISTANT ART of agriculture, I have never paid particular attention; except to a few disorders, which require the more immediate attention of the farmer. For although this important branch of the medical science is, at present, with respect to FARM STOCK, in the hands of the illiterate, I have ever considered it safer, to trust to practice without theory, than to theory without practice.

Much is to be expected from a PUBLIC INSTITUTE, with respect to this important subject. For although the HORSE has, for ages past, received, and is, at present, more than heretofore, receiving, an attention nearly equal to what has been bestowed on the species, the three more valuable animals (in a national light) may be said to remain without assistance, or, at best, to be exposed to conceit and prejudice; and must, almost necessarily, remain in the same helpless state, without some RURAL ESTABLISHMENT, calculated to relieve them.

TOWNS are, doubtless, the proper places, for studying the disorders of HORSES, and applying the suitable remedies. But to prosecute, with due effect, the study of medicine and surgery, as applicable to CATTLE, SWINE, and SHEEP, a COUNTRY SITUATION, and an EXTENSIVE FARM, connected with a SCIENTIFIC ESTABLISHMENT, may be deemed essentially requisite.

The few particulars, belonging to this subject, which occurred to my practice, in the Southern Department, and which I have preserved in the present edition, relate to the violent disorder of cattle, which is known

under various names, in different provinces, and which I have termed SUFFLATION: a disorder of which every practical farmer ought to know the proper treatment.

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106. An ox died sufflated, on *stale* clover.

— Reflections on this remarkable fact.

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— The remedies used.

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— General remarks, on the disorder.

— Its cause, means, effect, cure, and prevention, suggested.

— On the expedient of stabbing, or giving vent.

172. A gullet rammer provided; and its proper length determined.

178. The same cow sufflated, again, with cabbages.

265. And again!

— The efficacy of the rammer, fully evinced.

37.

VEGETABLE ECONOMY.

IN the DIGEST of the first edition of the MINUTES of AGRICULTURE, I endeavored to extract every particular bearing any relation to this subject: which may well be considered as being still in the infant state; very little concerning it, of a practical nature, except Dr. HALE's experiments, having yet, I believe, been communicated to the English public.

Since the publication of that work, I have not been unattentive to the subject: having collected several incidental particulars, and pursued some experiments, respecting it: which, together with what might be gathered, from the works of other writers, on rural science, may serve, at least, as hints towards a more mature investigation of the subject, whenever a COLLEGE, or INSTITUTE of AGRICULTURE shall be founded, on a basis sufficiently broad and firm, to give effect to research, and permanency to discoveries.

In pursuing the theory, or principles, of agriculture, the VEGETABLE ECONOMY is among the first subjects to be investigated: until we are acquainted with the structure and habits of plants, their nourishment and modes of growth, we must proceed in the dark, or be led by experience alone, to their proper food and treatment.

MINUTES.

14. Cultivated herbage vegetates earlier, in a dry, than in a cold, wet, situation ; and why.
18. By an experiment, the prolificness of vegetables was not hereditary.
63. Perhaps, the motion of vegetables is requisite to their strength and health.
67. White clover propagates, by the joints of the stems, as well as by the seed.
71. An evidence that vegetables acquire *substance*, chiefly, in dry weather.
77. Observations on the honey dew.
79. Vegetables are much sooner renewed, by roots already formed, than they are, in the first instance, formed from the seed.
87. A strong evidence, that the food of vegetables is not of a volatile nature.

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- Thin-bodied wheat, which vegetated
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lowing autumn.
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233. Another proof of the unvolatility of vegetable food.
- General reflections, on meliorating the soil, for the purposes of vegetation.
239. A further experiment, with blighted wheat.
- An evidence, that strong brine injured the vegetative property of wheat.
259. The agents of factitious vegetation, or those employed in producing agricultural vegetables, noticed.

38.

INVENTION.

INVENTION, to which every human art and science may be said to owe its origin, rise, and maturity, is itself an art, which is capable of scientific arrangement.

A man, who has long been in the habits of prosecuting improvements, and who is enured to success, disappointment, and miscarriage, will more readily discover a prac-

tical method, than one who is unpractised in the ART OF INVENTION.

And were we possessed of the guiding principles, and practical criteria, of men accustomed to depart from the beaten track, to explore untrodden ground, and trace out fresh paths, where no one has had courage, or hardihood, to venture, we should be enabled to make out a THEORY OF INVENTION, which might materially assist, in forwarding the endeavors of future adventurers, in this toilsome, and ill paid employment : ridicule, rather than applause, being its ordinary recompense : even though to it we owe whatever distinguishes civilized, from savage life !!!

The following hints are gleaned from the Minutes, on the construction, or improvement, of implements ; and are such as resulted, incidentally, from the successes and miscarriages, which attended the various attempts I made, in this part of the Island, towards the increase, and improvement, of the instruments of agriculture.

I draw them together, here, by way of incitement to those who may, happily for the species, be employed on subjects of

improvement ; in order to induce them to catch, in the fleeting moment, and fix, for the use of others, every principle, and instructive fact, which arises from their labors.

MINUTES.

5. It is dangerous to generalize ideas, hastily, in matters of invention.
49. Miscarriages may lead to useful inventions.
56. A further instance of useless materials being applied to a valuable purpose.
60. The difficulties of invention shown, in a nomenclature of the terms of tillage.
62. The best mode of using is not less difficult to ascertain, than the best mode of construction.
- . Perseverance is requisite to the maturation of new inventions.
83. Another evidence of the danger of general inferences.

And, in addition to the above, the first edition contained the following intimations ; drawn from experience, in constructing implements, which either proved abortive, or which are not thought of sufficient importance, to be entitled to further notice.

Practice, sufficiently persevered in, is the only infallible test of new inventions.

Perhaps, never swerve, far, from *original ideas*, from *first thoughts*, before they have been duly tested.

Self attention is requisite to the maturation of new inventions.

Simplicity is a leading principle, in the construction of instruments of agriculture.

39.

AGRICULTURAL KNOWLEDGE,

Or Observations concerning the
SCIENCE of AGRICULTURE.

THE following particulars are extracted from the MINUTES, &c. and drawn together, here, to impress, with concentrate effect, the utility of scrutinizing established practices, of recording valuable incidents, and registering the results of experiments: thereby

increasing practical knowledge, and preserving, for the benefit of succeeding, as well as the present times, whatever is superiorly useful to the profession.

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POLITICAL ECONOMY.

THE few particulars, which relate to this subject, in the present Volumes, are collected, here, for the sake of method, rather than from any design to bring the general subject forward, in this place.

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